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Rexroth
Bosch Group

Rexroth NYCe4000

Multi-axis motion control system

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Standard Housings and Accessories Manual

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1 Introduction

1.1 Purpose of Documentation

This NYCe4000 Standard Housings and Accessories Manual provides information about hardware of the NYCe4000 system.

This Standard Housings and Accessories Manual is intended for electrical engineers, system engineers and users of the NYCe4000 system. They can use this document as a reference for connecting and installing a specific NYCe4000 system.

WARNING

Personal injury and property damage can be caused by incorrect usage of the modules, machines and installations!

⇒ Take the content of this Standard Housings and Accessories Manual into account.

This Standard Housings and Accessories Manual, among other things, contains:

- specifications for the components of the drive system
- configuration of the drive system components
- arrangement of the components in the control cabinet
- connections of the components in the drive system
- replacing devices

1.2 General Information

Damage can be caused to the NYCe4000 module or circuit boards if electrostatic charge present in people and/or tools is discharged across them. Therefore, please note the following information:

CAUTION

Electrostatic charges can cause damage to electronic components and interfere with their operational safety!

⇒ Objects that come into contact with components and circuit boards must be discharged by means of grounding. Otherwise errors may occur when triggering motors and moving elements.

Such objects include:

- the copper bit when soldering
- the human body (discharge through touching a conductive, grounded item)
- parts and tools (placing on a conductive support)

Components sensitive to electrostatic discharge may only be stored or dispatched in conductive packaging.

Note:
Rexroth connection diagrams are only to be used for producing installation connection diagrams. The machine manufacturer's installation connection diagrams must be used for wiring the installation!

- Route signal lines separately from the load resistance lines because of the occurrence of interference.
- Feed analog signals (for example, command values, actual values) via shielded lines.
- Do not connect mains, DC bus or power leads to low voltages or allow them to come into contact.
- When carrying out a high voltage test or insulation withstand test on the machine's electrical equipment, disconnect all connections to the units. This protects the electronic components (permitted in accordance with EN 60204-1).

CAUTION

Plugging and unclamping live connections can damage the controller.

⇒ Do not plug in or unclamp live connections.

2 Important Directions for Use

2.1 Appropriate Use

Introduction

Rexroth products represent state-of-the-art developments and manufacturing. They are tested prior to delivery to ensure operating safety and reliability.

The products may only be used in the manner that is defined as appropriate. If they are used in an inappropriate manner, then situations can develop that may lead to property damage or injury to personnel.

Note:
Rexroth, as manufacturer, is not liable for any damages resulting from inappropriate use. In such cases, the guarantee and the right to payment of damages resulting from inappropriate use are forfeited. The user alone carries all responsibility of the risks.

Before using Rexroth products, make sure that all the pre-requisites for an appropriate use of the products are satisfied:

- Personnel that in any way, shape or form uses our products must first read and understand the relevant safety instructions and be familiar with appropriate use.
- If the product takes the form of hardware, then they must remain in their original state, in other words, no structural changes are permitted.
  It is not permitted to decompile software products or alter source codes.
- Do not install damaged or faulty products or use them in operation.
- Make sure that the products have been installed in the manner described in the relevant documentation.

Areas of Use and Application

NYCe4000 modules made by Rexroth are designed to control electrical motors and monitor their operation.

Control and monitoring of the motors may require additional sensors and actuators.

Note:
The NYCe4000 modules may only be used with the accessories and parts specified in this document. If a component has not been specifically named, then it may not be either installed or connected. The same applies to cables and lines.

Operation is only permitted in the specified configurations and combinations of components using the software and firmware as specified in the relevant function descriptions.

Every NYCe4000 module must be programmed before starting it up, making it possible for the motor to execute the specific functions of an application. The NYCe4000 modules are designed for use in single or multiple-axis drive and control applications.

To ensure an application-specific use, the NYCe4000 modules are available with differing drive power and different interfaces.

Typical applications of NYCe4000 modules are the following.

- semiconductor machines
- medical machines

The NYCe4000 modules may only be operated under the assembly, installation and ambient conditions as described here (temperature, system of protection, humidity, EMC requirements, etc.) and in the position specified.

Inappropriate Use

Using the NYCe4000 modules outside of the above-referenced areas of application or under operating conditions other than described in the document and the technical data specified is defined as “inappropriate use".

NYCe4000 modules may not be used

- if they are subject to operating conditions that do not meet the above specified ambient conditions. This includes, for example, operation under water, in case of extreme temperature fluctuations or extremely high maximum temperatures or
- if Rexroth has not specifically released them for that intended purpose. Please note the specifications outlined in the general safety instructions!

3 Safety Instructions for Electric Drives and Controls

3.1 Introduction

Read these instructions before the initial startup of the equipment in order to eliminate the risk of bodily harm or material damage. Follow these safety instructions at all times.

Do not attempt to install or start up this equipment without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation of the equipment prior to working with the equipment at any time. If you do not have the user documentation for your equipment, contact your local Rexroth representative to send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

If the equipment is resold, rented or transferred or passed on to others, then these safety instructions must be delivered with the equipment.

WARNING

Improper use of this equipment, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, may result in material damage, bodily harm, electric shock or even death!

3.2 Explanations

The safety instructions describe the following degrees of hazard seriousness in compliance with ANSI Z535. The degree of hazard seriousness informs about the consequences resulting from noncompliance with the safety instructions.

Table 1 Hazard classification (according to ANSI Z535)

Warning symbol with signal word	Degree of hazard seriousness according to ANSI Z535
DANGER	Death or severe bodily harm will occur.
WARNING	Death or severe bodily harm may occur.
CAUTION	Bodily harm or material damage may occur.

3.3 Hazards by Improper Use

DANGER

High voltage and high discharge current!

Danger to life or severe bodily harm by electric shock!

DANGER

Dangerous movements!

Danger to life, severe bodily harm or material damage by unintentional motor movements!

WARNING

High electrical voltage due to wrong connections!

Danger to life or bodily harm by electric shock!

WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

CAUTION

Surface of machine housing could be extremely hot!

Danger of injury!

Danger of burns!

CAUTION

Risk of injury due to improper handling!

Bodily harm caused by crushing, shearing, cutting and mechanical shock or incorrect handling of pressurized systems!

CAUTION

Risk of injury due to incorrect handling of batteries!

3.4 General Information

- Bosch Rexroth AG is not liable for damages resulting from failure to observe the warnings provided in this documentation.
- Read the operating, maintenance and safety instructions in your language before starting up the machine. If you find that you cannot completely understand the documentation for your product, please ask your supplier to clarify.
- Proper and correct transport, storage, assembly and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this equipment.
- Only persons who are trained and qualified for the use and operation of the equipment may work on this equipment or within its proximity.
  - The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the equipment as well as an understanding of all warnings and precautionary measures noted in these instructions.
  - Furthermore, they must be trained, instructed and qualified to switch electrical circuits and equipment on and off in accordance with technical safety regulations, to ground them and to mark them according to the requirements of safe work practices. They must have adequate safety equipment and be trained in first aid.
- Only use spare parts and accessories approved by the manufacturer.
- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The equipment is designed for installation in industrial machinery.
- The ambient conditions given in the product documentation must be observed.
- Use only safety features and applications that are clearly and explicitly approved in the Standard Housings Manual.
  For example, the following areas of use are not permitted: construction cranes, elevators used for people or freight, devices and vehicles to transport people, medical applications, refinery plants, transport of hazardous goods, nuclear applications, applications sensitive to high frequency, mining, food processing, control of protection equipment (also in a machine).
- The information given in the documentation of the product with regard to the use of the delivered components contains only examples of applications and suggestions.
  The machine and installation manufacturer must
  - make sure that the delivered components are suited for his individual application and check the information given in this documentation with regard to the use of the components,
  - make sure that his application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
- Startup of the delivered components is only permitted once it is sure that the machine or installation in which they are installed complies with the national regulations, safety specifications and standards of the application.
- Operation is only permitted if the national EMC regulations for the application are met.
  The machine or installation manufacturer is responsible for compliance with the limiting values as prescribed in the national regulations.
- Technical data, connections and operational conditions are specified in the product documentation and must be followed at all times.

3.5 Protection against Contact with Electrical Parts

Note:
This section refers to equipment and drive components with voltages above 50 Volts.

Touching live parts with voltages of 50 Volts and higher with bare hands or conductive tools or touching ungrounded housings can be dangerous and cause electric shock. In order to operate electrical equipment, certain parts must unavoidably have dangerous voltages applied to them.

DANGER

High electrical voltage!

Danger to life, severe bodily harm by electric shock!

⇒ Only people trained and qualified to work with or on electrical equipment are permitted to operate, maintain or repair this equipment.

⇒ Follow general construction and safety regulations when working on high voltage installations.

⇒ Before switching on power, the ground wire must be permanently connected to all electrical units according to the connection diagram.

⇒ Do not operate electrical equipment at any time, even for brief measurements or tests, if the ground wire is not permanently connected to the points of the components provided for this purpose.

⇒ Before working with electrical parts with voltage higher than 50 V, the equipment must be disconnected from the mains voltage or power supply. Make sure the equipment cannot be switched on again unintended.

⇒ The following should be observed with electrical drive and filter components:

⇒ Wait thirty (30) minutes after switching off power to allow capacitors to discharge before you start any work on the equipment. Measure the voltage on the capacitors before you start any work on the equipment to make sure that the equipment is safe to touch.

⇒ Never touch the electrical connection points of a component while power is turned on.

⇒ Install the covers and guards provided with the equipment properly before switching the equipment on.

⇒ Prevent contact with live parts at any time.

⇒ A residual-current-operated protective device (RCD) must not be used on electric drives! Indirect contact must be prevented by other means, for example, by an over current protective device.

⇒ Electrical components with exposed live parts and uncovered high voltage terminals must be installed in a protective housing, for example, in a control cabinet.

To be observed with electrical drive and filter components:

DANGER

High electrical voltage on the housing!

High leakage current!

Danger to life, danger of injury by electric shock!

⇒ Connect the electrical equipment, the housings of all electrical units and motors permanently with the safety conductor at the ground points before power is switched on. Look at the connection diagram. This is even necessary for brief tests.

⇒ Connect the safety conductor of the electrical equipment always permanently and firmly to the supply mains. Leakage current exceeds 3.5 mA in normal operation.

⇒ Use a copper conductor with at least 2.5 mm² cross section over its entire course for this safety conductor connection! The cross section must not be smaller than the cross section of a phase of the mains supply wire.

⇒ Prior to startups, even for brief tests, always connect the protective conductor or connect with ground wire. Otherwise, high voltages can occur on the housing that lead to electric shock.

3.6 Protection against Electric Shock by Protective Low Voltage (PELV)

All connections and terminals with voltages between 0 and 50 Volts on Rexroth products are protective low voltages designed in accordance with international standards on electrical safety.

WARNING

High electrical voltage due to wrong connections!

Danger to life, bodily harm by electric shock!

⇒ Only connect equipment, electrical components and cables of the protective low voltage type (PELV = Protective Extra Low Voltage) to all terminals and clamps with voltages of 0 to 50 Volts.

⇒ Only electrical circuits may be connected which have double or reinforced isolation against high voltage circuits. Double or reinforced isolation is achieved, for example, with an isolating transformer or when battery-operated.

3.7 Protection against Dangerous Movements

Dangerous movements can be caused by faulty control of the connected motors. Some common examples are:

- improper or wrong wiring of cable connections
- incorrect operation of the equipment components
- wrong input of parameters before operation
- malfunction of sensors, encoders and monitoring devices
- defective components
- software or firmware errors

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

The monitoring in the drive components will normally be sufficient to avoid faulty operation in the connected drives. Regarding personal safety, especially the danger of bodily injury and material damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.

DANGER

Dangerous movements!

Danger to life, risk of injury, severe bodily harm or material damage!

⇒ Ensure personal safety by means of qualified and tested higher-level monitoring devices or measures integrated in the installation. Unintended machine motion is possible if monitoring devices are disabled, bypassed or not activated.

⇒ Pay attention to unintended machine motion or other malfunction in any mode of operation.

⇒ Keep free and clear of the machine's range of motion and moving parts. Possible measures to prevent people from accidentally entering the machine's range of motion:

- use safety fences
- use safety guards
- use protective coverings
- install light curtains or light barriers

⇒ Fences and coverings must be strong enough to resist maximum possible momentum, especially if there is a possibility of loose parts flying off.

⇒ Mount the emergency stop switch in the immediate reach of the operator. Verify that the emergency stop works before startup. Do not operate the machine if the emergency stop is not working.

⇒ Isolate the drive power connection by means of an emergency stop circuit or use a starting lockout to prevent unintentional start.

⇒ Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone. Safe standstill can be achieved by switching off the power supply contactor or by safe mechanical locking of moving parts.

⇒ Secure vertical axes against falling or dropping after switching off the motor power by, for example:

- mechanically securing the vertical axes
- adding an external braking/ arrester/ clamping mechanism

- ensuring sufficient equilibration of the vertical axes

The standard equipment motor brake or an external brake controlled directly by the drive controller is not sufficient to guarantee personal safety!

⇒ Disconnect electrical power to the equipment using a master switch and secure the switch against reconnection for:

- maintenance and repair work
- cleaning of equipment
- long periods of discontinued equipment use

⇒ Prevent the operation of high-frequency, remote control and radio equipment near electronics circuits and supply leads. If the use of such equipment cannot be avoided, verify the system and the installation for possible malfunctions in all possible positions of normal use before initial startup. If necessary, perform a special electromagnetic compatibility (EMC) test on the installation.

3.8 Protection against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated near current-carrying conductors and permanent magnets in motors represent a serious health hazard to persons with heart pacemakers, metal implants and hearing aids.

WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

⇒ Persons with heart pacemakers, hearing aids and metal implants are not permitted to enter the following areas:

- Areas in which electrical equipment and parts are mounted, being operated or started up.
- Areas in which parts of motors with permanent magnets are being stored, operated, repaired or mounted.

⇒ If it is necessary for a person with a heart pacemaker to enter such an area, then a doctor must be consulted prior to doing so. Heart pacemakers that are already implanted or will be implanted in the future, have a considerable variation in their electrical noise immunity. Therefore there are no rules with general validity.

⇒ Persons with hearing aids, metal implants or metal pieces must consult a doctor before they enter the areas described above. Otherwise, health hazards will occur.

3.9 Protection against Contact with Hot Parts

CAUTION

Housing surfaces can be extremely hot!

Danger of injury! Danger of burns!

⇒ Do not touch housing surfaces near sources of heat! Danger of burns!

⇒ After switching the equipment off, wait at least ten (10) minutes to allow it to cool down before touching it.

⇒ Do not touch hot parts of the equipment, such as housings with integrated heat sinks and resistors. Danger of burns!

3.10 Protection during Handling and Mounting

Under certain conditions, incorrect handling and mounting of parts and components may cause injuries.

CAUTION

Risk of injury by incorrect handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock!

⇒ Observe general installation and safety instructions with regard to handling and mounting.

⇒ Use appropriate mounting and transport equipment.

⇒ Take precautions to avoid pinching and crushing.

⇒ Use only appropriate tools. If specified by the product documentation, special tools must be used.

⇒ Use lifting devices and tools correctly and safely.

⇒ For safe protection wear appropriate protective clothing, for example safety glasses, safety shoes and safety gloves.

⇒ Never stand under suspended loads.

⇒ Clean up liquids from the floor immediately to prevent slipping.

3.11 Battery Safety

Batteries contain reactive chemicals in a solid housing. Inappropriate handling may result in injuries or material damage.

CAUTION

Risk of injury by incorrect handling!

⇒ Do not attempt to reactivate discharged batteries by heating or other methods (danger of explosion and cauterization).

⇒ Never charge non-chargeable batteries (danger of leakage and explosion).

⇒ Never throw batteries into a fire.

⇒ Do not dismantle batteries.

⇒ Do not damage electrical components installed in the equipment.

Note:
Be aware of environmental protection and disposal! The batteries contained in the product should be considered as hazardous material for land, air and sea

transport in the sense of the legal requirements (danger of explosion).
Dispose batteries separately from other waste.
Observe the legal requirements in the country of installation.

4 NY4012: 1 Drive Slot System Housing

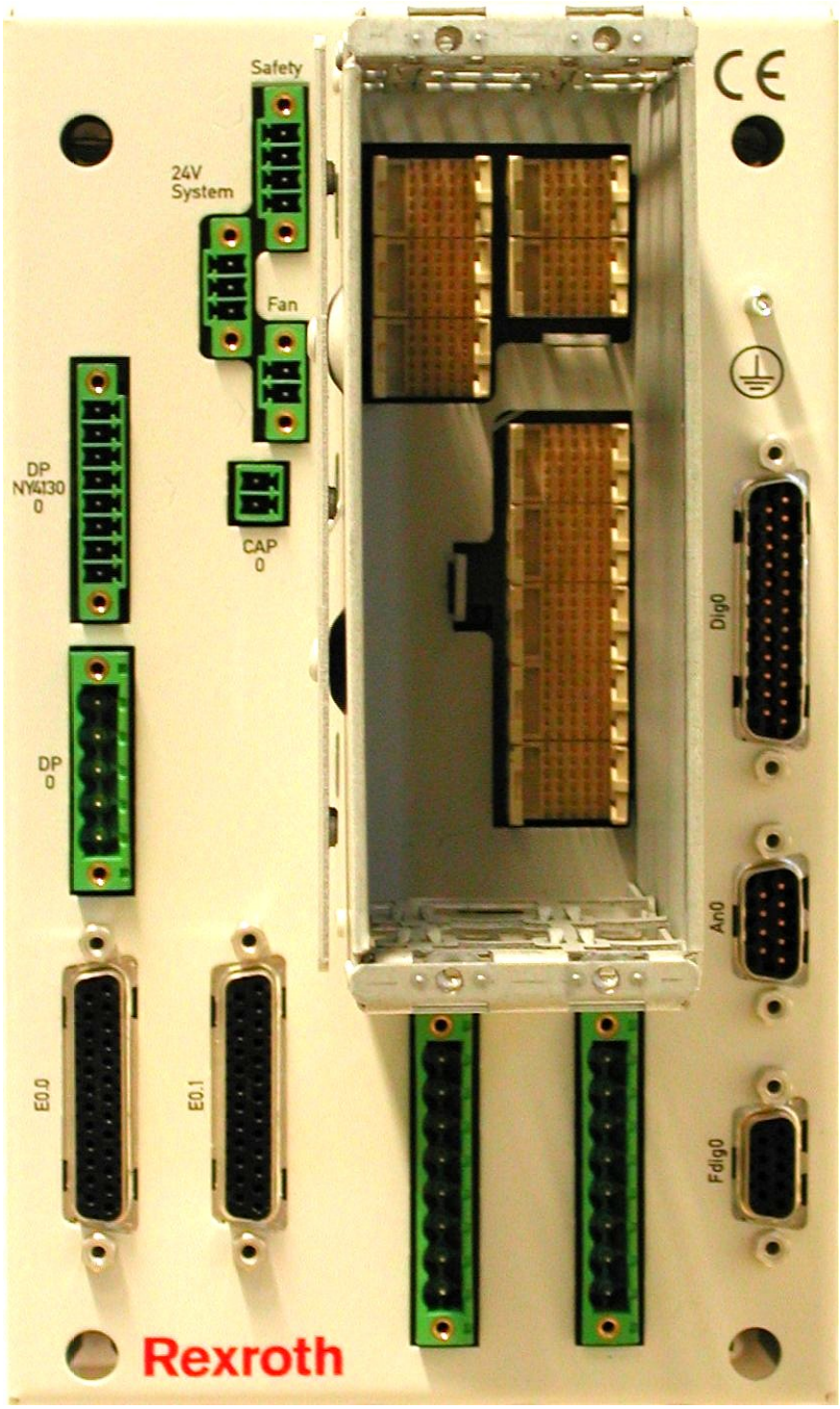


Fig. 1 NY4012 system housing

See section 16 ‘Mechanical Characteristics’ on page 136 for the dimensions of the system.

4.1 Safety input connector

Connector type on the backplane: male, 4 pins, Phoenix, MCV 1,5/ 4-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 4-STF-3,5, order code 1847071.

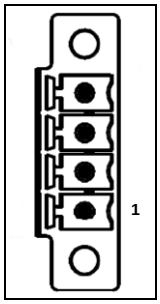


Fig. 2 Safety connector (backplane) pinout

The connector pin assignment is given in Table 1.

Table 1 Pinout Safety connector

Pin	Pin name	Function
1	SHIELD	Cable shield
2	INP_COMMON	Input common
3	INP_Safety	24 Volt input safety to MCU
4	INP_Emergency	24 Volt input emergency to MCU

4.2 24V System power connector

The main 24 Volt supply connector (24V System) that is used by the MCU module is to generate all the drive module and MCU module supply voltages.

Connector type on the backplane: male, 3 pins, Phoenix, MCV 1,5/ 3-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 3-STF-3,5, order code 1847068.

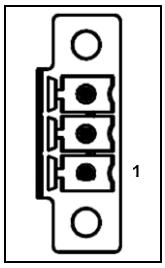


Fig. 3 24V System connector (backplane) pinout

The connector pin assignment is given in Table 2.
Wiring: shielded cable, wire diameter AWG18 (4 A).

Table 2 Pinout 24V System connector

Pin	Pin name	Function
1	24V_GND	24V common
2	+24V	System power (24 Volt DC)
3	SHIELD	Cable shield

Note:
24V_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

4.3 System fan unit connector

Connector type on the backplane: male, 2 pins, Phoenix, MCV 1,5/ 2-GF3,5.
Mating connector on the cable: Phoenix, MC 1,5/ 2-STF-3,5, order code 1847055.

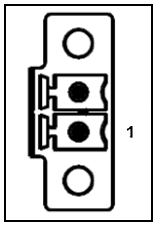


Fig. 4 Fan unit connector (backplane) pinout

The connection with the fuses on the system backplane is shown in Fig. 5, and the connector pin assignment is given in Table 3.
Wiring: unshielded cable, wire diameter AWG26.

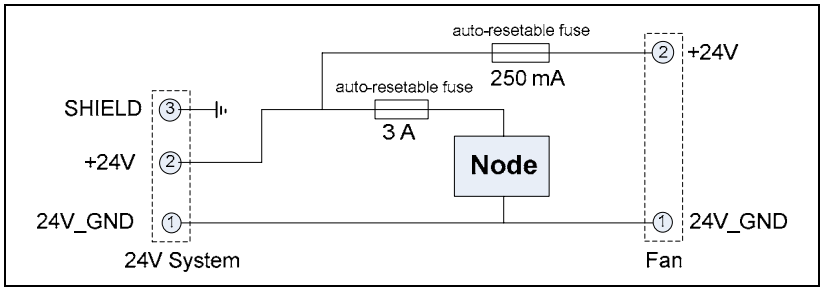


Fig. 5 Fan unit connection with auto-resetable fuse

Table 3 Pinout System fan connector

Pin	Pin name	Function
1	24V_GND	24V common (used for fan unit)
2	+24V	System power (used for fan unit)

4.4 NY4120 / NY4140 drive power connector

The NY4120 / NY4140 drive power connector is used to connect the drive power supply. The drive module has a separate drive power connector.

Connector type on the backplane: male, 5 pins, Phoenix, MSTBV 2,5/ 5-GF-5,08.

Mating connector on the cable is one of the following:

- MSTBC 2,5/ 5-STZF-5,08 order code 1809763, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C).
- QC 1/ 5-STF-5,08 suitable for field wiring, order code 1883381.

The following NY4120 / NY4140 drive power connector is available on the backplane:

- Drive Power 0 : drive power connector for drive module slot 1

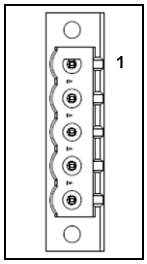


Fig. 6 NY4120 / NY4140 drive power connector (backplane) pinout

The connector pin assignment is given in Table 4.
Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 4 Pinout NY4120 / NY4140 drive power connector

Pin	Pin name	Function
1	DR_PWR+	+ Drive power supply module x
2	DR_PWR+	+ Drive power supply module x
3	SHIELD	Cable shield
4	DR_GND	Ground drive power supply module x
5	DR_GND	Ground drive power supply module x

Note:

DR_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

4.5 NY4130 drive power connector

The NY4130 drive power connector is used to connect the drive power supply.
Connector type on the backplane: male, 8 pins, Phoenix, MCV 1,5/ 8-GF-3,5.
Mating connector on the cable: Phoenix, MC 1,5/ 8-STF-3,5, order code 1847181.
The following drive power connector is available on the backplane:

- Drive Power NY4130 0 : drive power connector for drive module slot 1

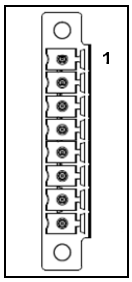


Fig. 7 NY4130 drive power connector (backplane) pinout

The connector pin assignment is given in Table 5.
Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 5 Pinout NY4130 drive power connector

Pin	Pin name	Function
1	DRVPW+L0	+ Drive power supply for first drive module
2	DRVPW-L0	- Drive power supply for first drive module
3	DR_GND	Ground Drive power supply for first drive module
4	SHIELD	Cable shield
5	SHIELD	Cable shield
6	DR_GND	Ground Drive power supply for second drive module
7	DRVPW-L1	- Drive power supply module for second drive module
8	DRVPW+L1	+ Drive power supply module for second drive module

Note:
DR_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

4.6 Filter capacitor connector

Connector type on the backplane: male, 2 pins, Phoenix, MCV 1,5/ 2-GF3,5.
Mating connector on the cable: Phoenix, MC 1,5/ 2-ST-3,5, order code 1840366.
The following filter capacitor connector is available on the backplane:

- CAP 0 : filter capacitor connector for Drive Power 0 connection

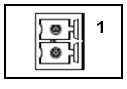


Fig. 8 Filter capacitor connector (backplane) pinout

The connector pin assignment is given in Table 6.

Table 6 Pinout Filter capacitor connector

Pin	Pin name	Function
1	DR_PWR	+ connection of the capacitor
2	DR_GND	- connection of the capacitor

Bosch Rexroth offers a standard Filter Capacitor kit, NY4921. See for more information chapter 11.

Note:
Observe the polarity of the connection to the capacitor and the working voltage of the capacitor, if you decide to dimension the filter capacitor tailored to your motion application.

4.7 Motor connectors

Each drive module contains two motor connectors, each connector for one axis.

Connector type on the backplane: male, 8 pins, Phoenix, MSTBV 2,5/ 8-GF-5,08.

Mating connector on the cable is one of the following:

- MSTBC 2,5/ 8-STZF-5,08 order code 1809792, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C needs to be used).
- QC 1/ 8-STF-5,08 suitable for field wiring, order code 1883417.

Note:
Motor connection to NY4140 differs from motor connection to NY4120 and NY4130.

The following motor connectors are available on the backplane:

- M0.0 and M0.1 : drive module slot 0 motor 0 and motor 1 connector

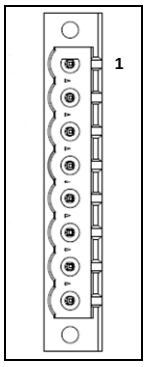


Fig. 9 Motor connector (backplane) pinout

The connector pin assignment for motor 0 of the NY4120 and NY4130, and the high voltage motor of the NY4140 is given in Table 7.

The connector pin assignment for motor 1 of the NY4120 and NY4130 is given in Table 8.

Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 7 Pinout motor Mx.0 (NY4120, NY4130, and NY4140) connectors

Pin	Pin name	Stepper motor NY4120	BLAC / BLDC motor NY4120	DC motor NY4120 NY4130	BLAC / DC motor NY4140
1	HB1+	A+		$+V_{DCmot}$	
2	HB1-	A-	U	$-V_{DCmot}$	U
3	HB2+	B+	V		
4	HB2-	B-	W		V / $+V_{DCmot}$
5	HB3-				W / $-V_{DCmot}$
6	DR_GND			Used for unbalanced motor (only on NY4130)	
7	SHIELD	Shield of motor cable			
8	PE	Protective earth of motor			

Table 8 Pinout motor Mx.1 (NY4120 and NY4130) connectors

Pin	Pin name	stepper motor NY4120	BLAC / BLDC motor NY4120	DC motor NY4120 NY4130
1	HB3+	A+		$+V_{DCmot}$
2	HB3-	A-	U	$-V_{DCmot}$
3	HB4+	B+	V	
4	HB4-	B-	W	
5		Not used		
6	DR_GND			Used for unbalanced motor (only on NY4130)
7	SHIELD	Shield of motor cable		
8	PE	Protective earth of motor		

Note:
This connector is not used in combination with an NY4140.

4.8 Encoder connectors

Each motor has its own encoder connector.
Connector type on the backplane: female, 25 pins sub-D.

The following encoder connectors are available on the backplane:

- E0.0 and E0.1 : drive module slot 0 encoder 0 and encoder 1 connector

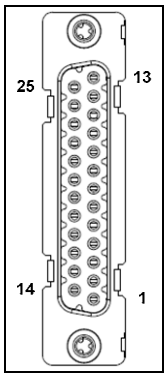


Fig. 10 Encoder E0.0 and encoder E0.1 connector (backplane) pinout

The connector pin assignment for the encoder connectors is given in Table 9.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 9 Pinout encoder connectors

Pin	EnDat2.2	EnDat2.1	MSM	Hiperface	Sincos	S00/S90
1	+5 Volt	+5 Volt	+5 Volt		+5 Volt	+5 Volt
2						+2.5 Volt
3						S00+
4						S90+
5						Index+
6	Clock+					Hall A+
7						Hall B+
8	Data+	Data+	Data+	Data+ (1)		Hall C+
9		Sine+		Sine+	Sine+	
10		Cosine+		Cosine+	Cosine+	
11					Index+	
12		Clock+		Data+ (1)		
13				+8 Volt		
14	0 Volt	0 Volt	0 Volt		0 Volt	0 Volt
15						S00-
16						S90-
17						Index-
18	Clock-					Hall A-
19						Hall B-
20	Data-	Data-	Data-	Data- (1)		Hall C-
21		Sine-		Sine-	Sine-	
22		Cosine-		Cosine-	Cosine-	
23					Index-	
24		Clock-		Data- (1)		
25				0 Volt		

Remark:
(1) For the Hiperface encoder cable, you must connect Data+ to pin 8 and pin 12, and connect Data- to pin 20 and pin 24.

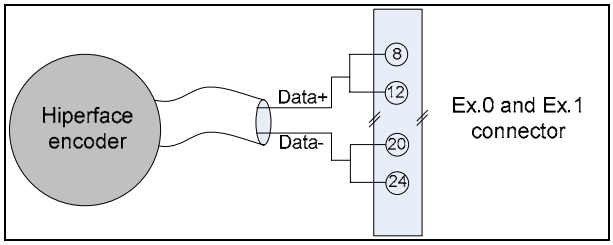


Fig. 11 Cable connection diagram for Hiperface encoders (Data signal lines)

Notes:
- Connect the shield of the cable to the shield of the sub-D connector.
- Use twisted pair cabling for the differential signals.

4.9 Fast digital I/O connector

The fast digital I/O connector (FDIG0) is available for each drive module.
Connection type on the backplane: female, 9 pins sub-D.

The following fast digital I/O connector is available on the backplane:

- FDIG0 : drive module slot 0 fast digital I/O connector

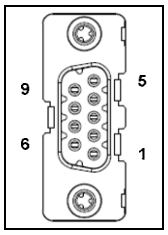


Fig. 12 Fast digital I/O connector (backplane) pinout

The connector pin assignment is given in Table 10.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 10 Pinout fast digital I/O connectors

Pin	Pin name	Function
1	GND_DIO	Ground for fast digital I/O
2	FastOut0	Fast 24 Volt Output 0
3	FastOut1	Fast 24 Volt Output 1
4	FastIn0	+ Fast 24 Volt Input 0
5	FastIn1	+ Fast 24 Volt Input 1
6	24V_DIO	24 Volt I/O supply
7	24V_DIO	24 Volt I/O supply
8	GND_DIO	Ground for digital I/O
9	GND_DIO	Ground for digital I/O

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- GND_DIO and 24V_DIO pins of the FDIG0 connectors are also connected to GND_DIO and 24V_DIO pins of the DIG0 connectors.

4.10 Digital I/O connector

The digital I/O connector (DIG0) is available for each drive module.
Connector type on the backplane: male, 25 pins sub-D.

The following digital I/O connector is available on the backplane:

- DIG0 : drive module slot 0 digital I/O connector

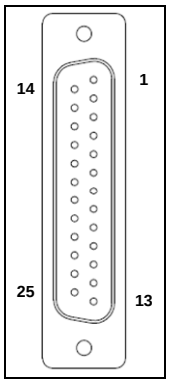


Fig. 13 Digital I/O connector (backplane) pinout

The connector pin assignment is given in Table 11.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 11 Pinout digital I/O connectors

Pin	Pin name	Function
1	DigIn0	Digital Input in group 0
2	DigIn1	Digital Input in group 0
3	DigIn2	Digital Input in group 0
4	DigIn3	Digital Input in group 0
5	DigIn4	Digital Input in group 1
6	DigIn5	Digital Input in group 1
7	DigIn6	- Digital Input in group 1, or - Stop alarm input for axis 0 in group 1 (only supported NY4120 and NY4140)
8	DigIn7	- Digital Input in group 1, or - Stop alarm input for axis 1 in group 1 (only supported NY4120)
9	GND_DIO	Ground for digital Output, connected to power supply
10	DigOut0	Digital Output
11	DigOut1	Digital Output
12	DigOut2	Digital Output
13	DigOut3	Digital Output
14	DigComm0	Common for digital Input group 0, may be ground or 24V
15	DigIn8	Digital Input in group 2 (only supported NY4130)
16	DigIn9	Digital Input in group 2 (only supported NY4130)
17	DigIn10	Stop alarm input for axis 0 in group 2 (only supported NY4130)
18	DigIn11	Stop alarm input for axis 1 in group 2 (only supported NY4130)
19	DigComm2	Common for digital Input group 2, may be ground or 24V (Note: connection to 24V only allowed if DigIn10 and DigIn11 are not used)
20	DigComm1	Common for digital Input group 1, may be ground or 24V
21	GND_DIO	Ground for digital Output, connected to power supply
22	24V_DIO	24 Volt digital Output supply
23	24V_DIO	24 Volt digital Output supply
24	24V_DIO	24 Volt digital Output supply
25	24V_DIO	24 Volt digital Output supply

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- Each pin is rated for a load of 1 A. Connect pin # 22, 23, 24, and 25 to match the total load connected to the digital output pins.
- GND_DIO and 24V_DIO pins of the DIG0 connectors are also connected to GND_DIO and 24V_DIO pins of the FDIG0 connectors.

4.11 Analog I/O connector

For each drive module an analog I/O connector is available.
Connector type on the backplane: male, 9 pins sub-D.

The following analog I/O connector is available on the backplane:

- AN0 : drive module slot 0 analog I/O connector

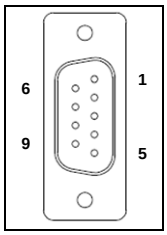


Fig. 14 Analog I/O connector (backplane) pinout

The connector pin assignment is given in Table 12.
Wiring: shielded cable, wire diameter AWG26.

Table 12 Pinout analog I/O connector

Pin	Pin name	Function
1	AnIn0+	Positive analog input +/- 10 V (differential or single ended)
2	AnIn0C	• NY4120/NY4140: Positive analog input 4-20 mA must be linked in connector to AnIn0+. • NY4130: analog reference output voltage.
3	AnIn0-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)
4	AnOut0+	Analog output
5	AnOut1+	Analog output
6	AnIn1+	Positive analog input +/- 10 V (differential or single ended)
7	AnIn1C	• NY4120/NY4140: Positive analog input 4-20 mA must be linked in connector to AnIn1+. • NY4130: analog reference output voltage.
8	AnGND	Return for analog output or 4-20 mA input, ground reference for inputs
9	AnIn1-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)

Notes:
- Connect the shield of the cable to the shield of the sub-D connector.
- Use twisted pair cabling for the differential signals (AnIn0+ / AnIn0- and AnIn1+ / AnIn1-)

5 NY4022: 2 Drive Slot System Housing

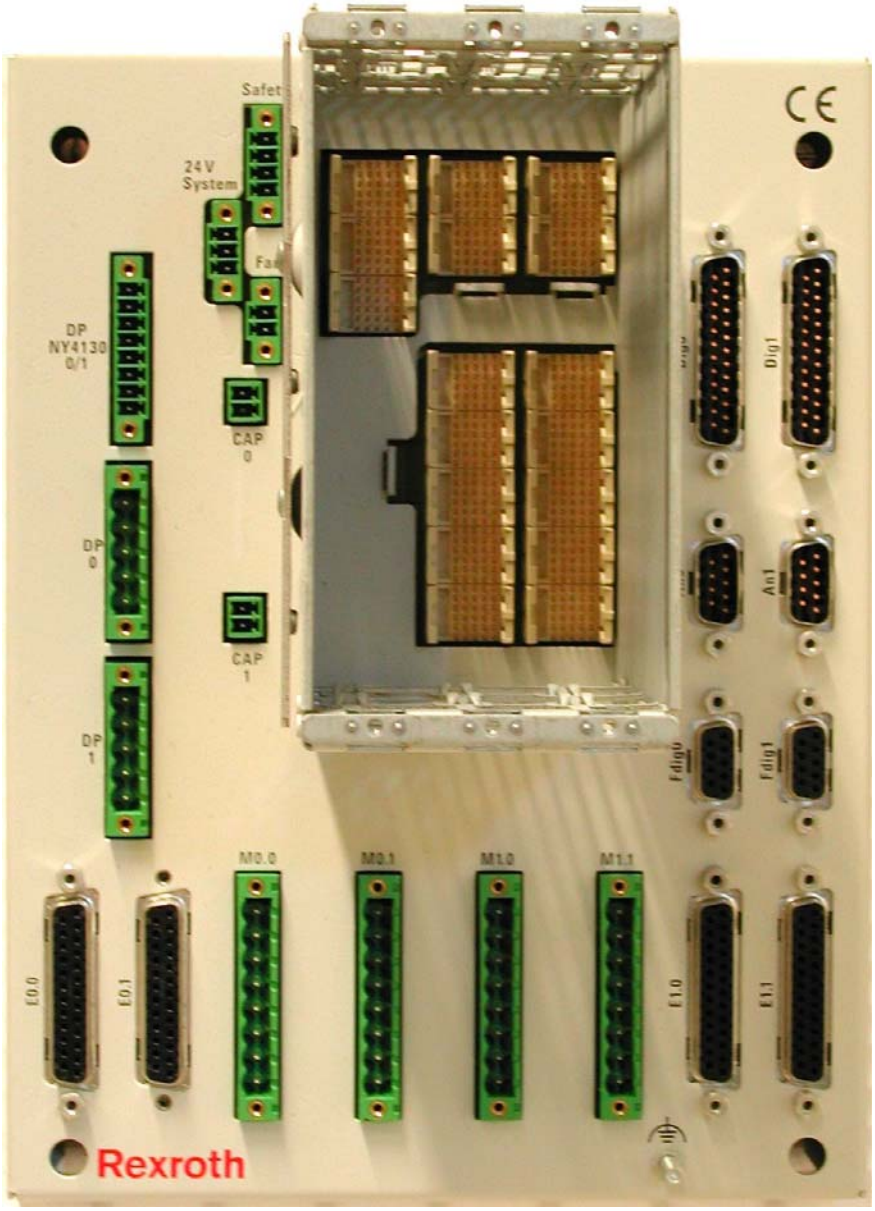


Fig. 15 NY4022 system housing

See section 16 ‘Mechanical Characteristics’ on page 136 for the dimensions of the system.

5.1 Safety input connector

Connector type on the backplane: male, 4 pins, Phoenix, MCV 1,5/ 4-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 4-STF-3,5, order code 1847071.

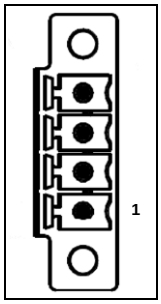


Fig. 16 Safety connector (backplane) pinout

The connector pin assignment is given in Table 13.

Table 13 Pinout Safety connector

Pin	Pin name	Function
1	SHIELD	Cable shield
2	INP_COMMON	Input common
3	INP_Safety	24 Volt input safety to MCU
4	INP_Emergency	24 Volt input emergency to MCU

5.2 24V System power connector

The main 24 Volt supply connector (24V System) that is used by the MCU module is to generate all the drive module and MCU module supply voltages.

Connector type on the backplane: male, 3 pins, Phoenix, MCV 1,5/ 3-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 3-STF-3,5, order code 1847068.

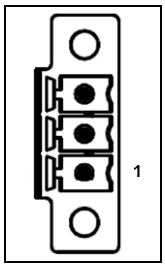


Fig. 17 24V System connector (backplane) pinout

The connector pin assignment is given in Table 14.
Wiring: shielded cable, wire diameter AWG18 (4 A).

Table 14 Pinout 24V System connector

Pin	Pin name	Function
1	24V_GND	24V common
2	+24V	System power (24 Volt DC)
3	SHIELD	Cable shield

Note:
24V_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

5.3 System fan unit connector

Connector type on the backplane: male, 2 pins, Phoenix, MCV 1,5/ 2-GF3,5.
Mating connector on the cable: Phoenix, MC 1,5/ 2-STF-3,5, order code 1847055.

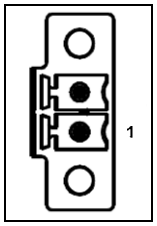


Fig. 18 Fan unit connector (backplane) pinout

The connection with the fuses on the system backplane is shown in Fig. 19, and the connector pin assignment is given in Table 15.
Wiring: unshielded cable, wire diameter AWG26.

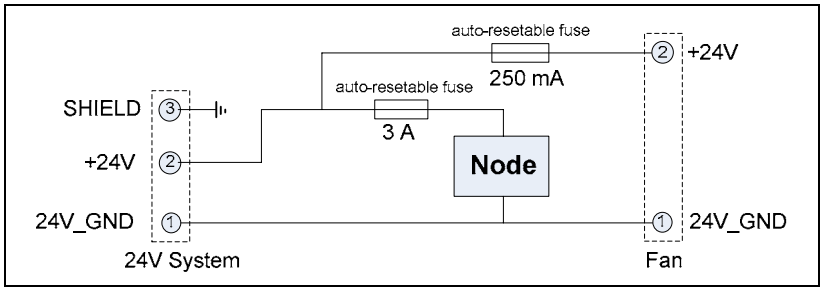


Fig. 19 Fan unit connection with auto-resetable fuse

Table 15 Pinout System fan connector

Pin	Pin name	Function
1	24V_GND	24V common (used for fan unit)
2	+24V	System power (used for fan unit)

5.4 NY4120 / NY4140 drive power connectors

The NY4120 / NY4140 drive power connectors are used to connect the drive power supply. For each drive module a separate drive power connector is available.

Connector type on the backplane: male, 5 pins, Phoenix, MSTBV 2,5/ 5-GF-5,08.

Mating connector on the cable is one of the following:

- MSTBC 2,5/ 5-STZF-5,08 order code 1809763, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C).
- QC 1/ 5-STF-5,08 suitable for field wiring, order code 1883381.

The following NY4120 / NY4140 drive power connectors are available on the backplane:

- Drive Power 0 : drive power connector for drive module slot 0
- Drive Power 1 : drive power connector for drive module slot 1

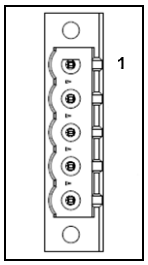


Fig. 20 NY4120 / NY4140 drive power connector (backplane) pinout

The connector pin assignment is given in Table 16.
Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 16 Pinout NY4120 / NY4140 drive power connector

Pin	Pin name	Function
1	DR_PWR+	+ Drive power supply module x
2	DR_PWR+	+ Drive power supply module x
3	SHIELD	Cable shield
4	DR_GND	Ground drive power supply module x
5	DR_GND	Ground drive power supply module x

Note:

DR_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

5.5 NY4130 drive power connector

The NY4130 drive power connector is used to connect the drive power supply.
Connector type on the backplane: male, 8 pins, Phoenix, MCV 1,5/ 8-GF-3,5.
Mating connector on the cable: Phoenix, MC 1,5/ 8-STF-3,5, order code 1847181.
The following drive power connector is available on the backplane:

- Drive Power NY4130 0/1 : drive power connector for drive module slot 0 and 1

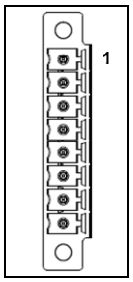


Fig. 21 NY4130 drive power connector (backplane) pinout

The connector pin assignment is given in Table 17.
Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 17 Pinout NY4130 drive power connector

Pin	Pin name	Function
1	DRVPW+L0	+ Drive power supply for first drive module
2	DRVPW-L0	- Drive power supply for first drive module
3	DR_GND	Ground Drive power supply for first drive module
4	SHIELD	Cable shield
5	SHIELD	Cable shield
6	DR_GND	Ground Drive power supply for second drive module
7	DRVPW-L1	- Drive power supply module for second drive module
8	DRVPW+L1	+ Drive power supply module for second drive module

Note:
DR_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

5.6 Filter capacitor connectors

Connector type on the backplane: male, 2 pins, Phoenix, MCV 1,5/ 2-GF3,5.
Mating connector on the cable: Phoenix, MC 1,5/ 2-ST-3,5, order code 1840366.
The following filter capacitor connectors are available on the backplane:

- CAP 0 : filter capacitor connector for Drive Power 0 connection
- CAP 1 : filter capacitor connector for Drive Power 1 connection

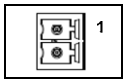


Fig. 22 Filter capacitor connector (backplane) pinout

The connector pin assignment is given in Table 18.

Table 18 Pinout Filter capacitor connector

Pin	Pin name	Function
1	DR_PWR	+ connection of the capacitor
2	DR_GND	- connection of the capacitor

Bosch Rexroth offers a standard Filter Capacitor kit, NY4921. See for more information chapter 11.

Note:
Observe the polarity of the connection to the capacitor and the working voltage of the capacitor, if you decide to dimension the filter capacitor tailored to your motion application.

5.7 Motor connectors

Each drive module contains two motor connectors, each connector for one axis.

Connector type on the backplane: male, 8 pins, Phoenix, MSTBV 2,5/ 8-GF-5,08.

Mating connector on the cable is one of the following:

- MSTBC 2,5/ 8-STZF-5,08 order code 1809792, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C needs to be used).
- QC 1/ 8-STF-5,08 suitable for field wiring, order code 1883417.

Note:
Motor connection to NY4140 differs from motor connection to NY4120 and NY4130.

The following motor connectors are available on the backplane:

- M0.0 and M0.1 : drive module slot 0 motor 0 and motor 1 connector
- M1.0 and M1.1 : drive module slot 1 motor 0 and motor 1 connector

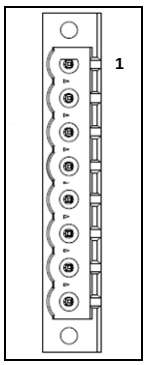


Fig. 23 Motor connector (backplane) pinout

The connector pin assignment for motor 0 of the NY4120 and NY4130, and the high voltage motor of the NY4140 is given in Table 19.

The connector pin assignment for motor 1 of the NY4120 and NY4130 is given in Table 20.

Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 19 Pinout motor Mx.0 (NY4120, NY4130, and NY4140) connectors

Pin	Pin name	Stepper motor NY4120	BLAC / BLDC motor NY4120	DC motor NY4120 NY4130	BLAC / DC motor NY4140
1	HB1+	A+		$+V_{DCmot}$	
2	HB1-	A-	U	$-V_{DCmot}$	U
3	HB2+	B+	V		
4	HB2-	B-	W		V / $+V_{DCmot}$
5	HB3-				W / $-V_{DCmot}$
6	DR_GND			Used for unbalanced motor (only on NY4130)	
7	SHIELD	Shield of motor cable			
8	PE	Protective earth of motor			

Table 20 Pinout motor Mx.1 (NY4120 and NY4130) connectors

Pin	Pin name	stepper motor NY4120	BLAC / BLDC motor NY4120	DC motor NY4120 NY4130
1	HB3+	A+		$+V_{DCmot}$
2	HB3-	A-	U	$-V_{DCmot}$
3	HB4+	B+	V	
4	HB4-	B-	W	
5		Not used		
6	DR_GND			Used for unbalanced motor (only on NY4130)
7	SHIELD	Shield of motor cable		
8	PE	Protective earth of motor		

Note:
This connector is not used in combination with an NY4140.

5.8 Encoder connectors

Each motor has its own encoder connector.
Connector type on the backplane: female, 25 pins sub-D.

The following encoder connectors are available on the backplane:

- E0.0 and E0.1 : drive module slot 0 encoder 0 and encoder 1 connector
- E1.0 and E1.1 : drive module slot 1 encoder 0 and encoder 1 connector

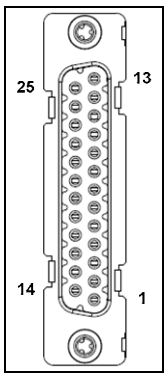


Fig. 24 Encoder Ex.0 and encoder Ex.1 connector (backplane) pinout

The connector pin assignment for the encoder connectors is given in Table 21.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 21 Pinout encoder connectors

Pin	EnDat2.2	EnDat2.1	MSM	Hiperface	Sincos	S00/S90
1	+5 Volt	+5 Volt	+5 Volt		+5 Volt	+5 Volt
2						+2.5 Volt
3						S00+
4						S90+
5						Index+
6	Clock+					Hall A+
7						Hall B+
8	Data+	Data+	Data+	Data+ (1)		Hall C+
9		Sine+		Sine+	Sine+	
10		Cosine+		Cosine+	Cosine+	
11					Index+	
12		Clock+		Data+ (1)		
13				+8 Volt		
14	0 Volt	0 Volt	0 Volt		0 Volt	0 Volt
15						S00-
16						S90-
17						Index-
18	Clock-					Hall A-
19						Hall B-
20	Data-	Data-	Data-	Data- (1)		Hall C-
21		Sine-		Sine-	Sine-	
22		Cosine-		Cosine-	Cosine-	
23					Index-	
24		Clock-		Data- (1)		
25				0 Volt		

Remark:
(1) For the Hiperface encoder cable, you must connect Data+ to pin 8 and pin 12, and connect Data- to pin 20 and pin 24.

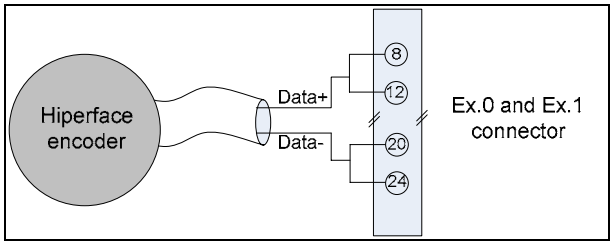


Fig. 25 Cable connection diagram for Hiperface encoders (Data signal lines)

Notes:
- Connect the shield of the cable to the shield of the sub-D connector.
- Use twisted pair cabling for the differential signals.

5.9 Fast digital I/O connectors

The fast digital I/O connector (FDIGx) is available for each drive module.
Connection type on the backplane: female, 9 pins sub-D.

The following fast digital I/O connectors are available on the backplane:

- FDIG0 : drive module slot 0 fast digital I/O connector
- FDIG1 : drive module slot 1 fast digital I/O connector

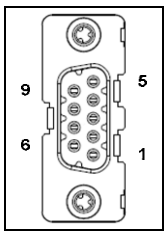


Fig. 26 Fast digital I/O connector (backplane) pinout

The connector pin assignment is given in Table 22.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 22 Pinout fast digital I/O connectors

Pin	Pin name	Function
1	GND_DIO	Ground for fast digital I/O
2	FastOut0	Fast 24 Volt Output 0
3	FastOut1	Fast 24 Volt Output 1
4	FastIn0	+ Fast 24 Volt Input 0
5	FastIn1	+ Fast 24 Volt Input 1
6	24V_DIO	24 Volt I/O supply
7	24V_DIO	24 Volt I/O supply
8	GND_DIO	Ground for digital I/O
9	GND_DIO	Ground for digital I/O

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- GND_DIO and 24V_DIO pins of the FDIGx connectors are also connected to GND_DIO and 24V_DIO pins of the DIGx connectors.

5.10 Digital I/O connectors

The digital I/O connector (DIGx) is available for each drive module.
Connector type on the backplane: male, 25 pins sub-D.

The following digital I/O connectors are available on the backplane:

- DIG0 : drive module slot 0 digital I/O connector
- DIG1 : drive module slot 1 digital I/O connector

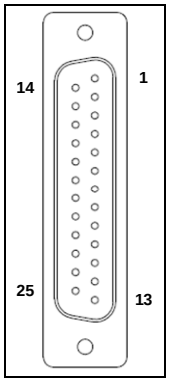


Fig. 27 Digital I/O connector (backplane) pinout

The connector pin assignment is given in Table 23.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 23 Pinout digital I/O connectors

Pin	Pin name	Function
1	DigIn0	Digital Input in group 0
2	DigIn1	Digital Input in group 0
3	DigIn2	Digital Input in group 0
4	DigIn3	Digital Input in group 0
5	DigIn4	Digital Input in group 1
6	DigIn5	Digital Input in group 1
7	DigIn6	- Digital Input in group 1, or - Stop alarm input for axis 0 in group 1 (only supported NY4120 and NY4140)
8	DigIn7	- Digital Input in group 1, or - Stop alarm input for axis 1 in group 1 (only supported NY4120)
9	GND_DIO	Ground for digital Output, connected to power supply
10	DigOut0	Digital Output
11	DigOut1	Digital Output
12	DigOut2	Digital Output
13	DigOut3	Digital Output
14	DigComm0	Common for digital Input group 0, may be ground or 24V
15	DigIn8	Digital Input in group 2 (only supported NY4130)
16	DigIn9	Digital Input in group 2 (only supported NY4130)
17	DigIn10	Stop alarm input for axis 0 in group 2 (only supported NY4130)
18	DigIn11	Stop alarm input for axis 1 in group 2 (only supported NY4130)
19	DigComm2	Common for digital Input group 2, may be ground or 24V (Note: connection to 24V only allowed if DigIn10 and DigIn11 are not used)
20	DigComm1	Common for digital Input group 1, may be ground or 24V
21	GND_DIO	Ground for digital Output, connected to power supply
22	24V_DIO	24 Volt digital Output supply
23	24V_DIO	24 Volt digital Output supply
24	24V_DIO	24 Volt digital Output supply
25	24V_DIO	24 Volt digital Output supply

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- Each pin is rated for a load of 1 A. Connect pin # 22, 23, 24, and 25 to match the total load connected to the digital output pins.
- GND_DIO and 24V_DIO pins of the DIGx connectors are also connected to GND_DIO and 24V_DIO pins of the FDIGx connectors.

5.11 Analog I/O connector

For each drive module an analog I/O connector is available.
Connector type on the backplane: male, 9 pins sub-D.

The following analog I/O connectors are available on the backplane:

- AN0 : drive module slot 0 analog I/O connector
- AN1 : drive module slot 1 analog I/O connector

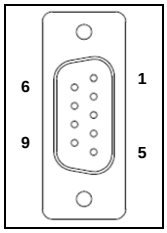


Fig. 28 Analog I/O connector (backplane) pinout

The connector pin assignment is given in Table 24.
Wiring: shielded cable, wire diameter AWG26.

Table 24 Pinout analog I/O connector

Pin	Pin name	Function
1	AnIn0+	Positive analog input +/- 10 V (differential or single ended)
2	AnIn0C	• NY4120/NY4140: Positive analog input 4-20 mA must be linked in connector to AnIn0+. • NY4130: analog reference output voltage.
3	AnIn0-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)
4	AnOut0+	Analog output
5	AnOut1+	Analog output
6	AnIn1+	Positive analog input +/- 10 V (differential or single ended)
7	AnIn1C	• NY4120/NY4140: Positive analog input 4-20 mA must be linked in connector to AnIn1+. • NY4130: analog reference output voltage.
8	AnGND	Return for analog output or 4-20 mA input, ground reference for inputs
9	AnIn1-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- Use twisted pair cabling for the differential signals (AnIn0+ / AnIn0- and AnIn1+ / AnIn1-).

6 NY4042: 4 Drive Slot System Housing

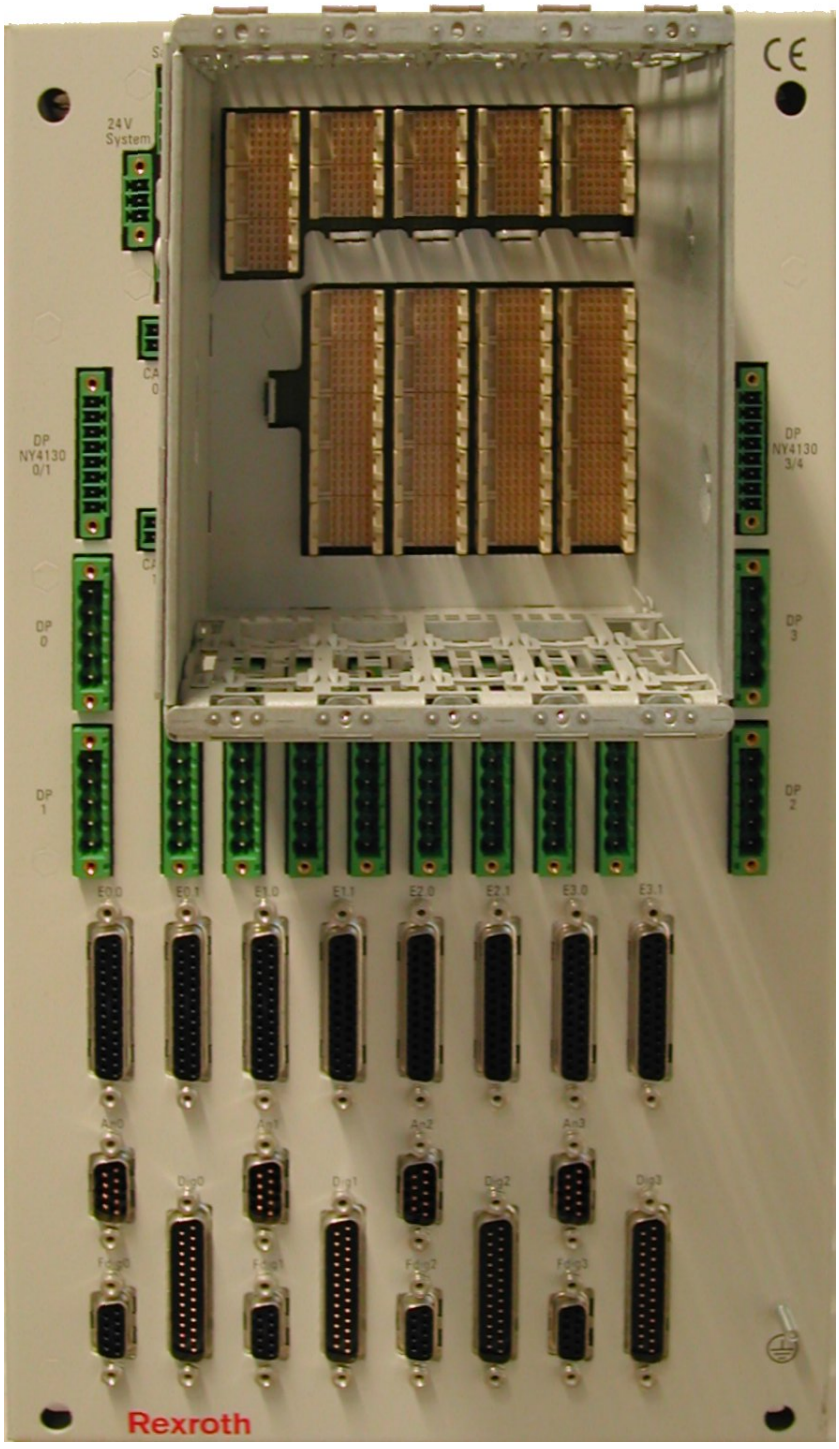


Fig. 29 NY4042 system housing

See section 16 ‘Mechanical Characteristics’ on page 136 for the dimensions of the system.

6.1 Safety input connector

Connector type on the backplane: male, 4 pins, Phoenix, MCV 1,5/ 4-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 4-STF-3,5, order code 1847071.

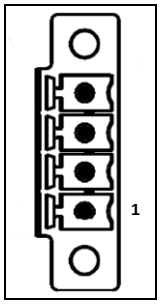


Fig. 30 Safety connector (backplane) pinout

The connector pin assignment is given in Table 25.

Table 25 Pinout Safety connector

Pin	Pin name	Function
1	SHIELD	Cable shield
2	INP_COMMON	Input common
3	INP_Safety	24 Volt input safety to MCU
4	INP_Emergency	24 Volt input emergency to MCU

6.2 24V System power connector

The main 24 Volt supply connector (24V System) that is used by the MCU module is to generate all the drive module and MCU module supply voltages.

Connector type on the backplane: male, 3 pins, Phoenix, MCV 1,5/ 3-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 3-STF-3,5, order code 1847068.

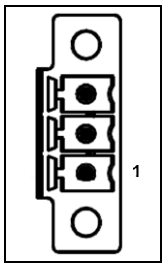


Fig. 31 24V System connector (backplane) pinout

The connector pin assignment is given in Table 26.
Wiring: shielded cable, wire diameter AWG18 (4 A).

Table 26 Pinout 24V System connector

Pin	Pin name	Function
1	24V_GND	24V common
2	+24V	System power (24 Volt DC)
3	SHIELD	Cable shield

Note:
24V_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

6.3 System fan unit connector

Connector type on the backplane: male, 2 pins, Phoenix, MCV 1,5/ 2-GF3,5.
Mating connector on the cable: Phoenix, MC 1,5/ 2-STF-3,5, order code 1847055.

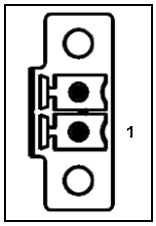


Fig. 32 Fan unit connector (backplane) pinout

The connection with the fuses on the system backplane is shown in Fig. 33, and the connector pin assignment is given in Table 27.
Wiring: unshielded cable, wire diameter AWG26.

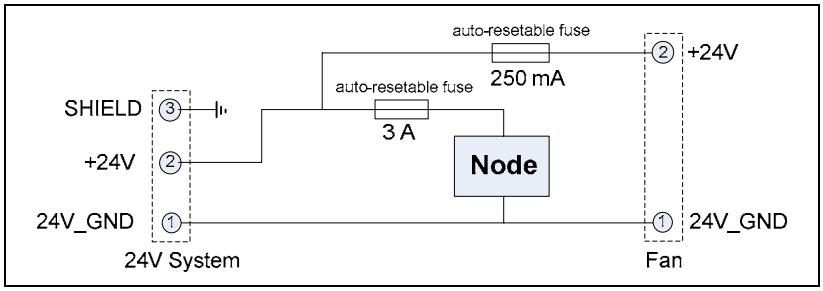


Fig. 33 Fan unit connection with auto-resetable fuse

Table 27 Pinout System fan connector

Pin	Pin name	Function
1	24V_GND	24V common (used for fan unit)
2	+24V	System power (used for fan unit)

6.4 NY4120 / NY4140 drive power connectors

The NY4120 / NY4140 drive power connectors are used to connect the drive power supply. For each drive module a separate drive power connector is available.

Connector type on the backplane: male, 5 pins, Phoenix, MSTBV 2,5/ 5-GF-5,08.

Mating connector on the cable is one of the following:

- MSTBC 2,5/ 5-STZF-5,08 order code 1809763, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C).
- QC 1/ 5-STF-5,08 suitable for field wiring, order code 1883381.

The following NY4120 / NY4140 drive power connectors are available on the backplane:

- Drive Power 0 : drive power connector for drive module slot 0
- Drive Power 1 : drive power connector for drive module slot 1
- Drive Power 2 : drive power connector for drive module slot 2
- Drive Power 3 : drive power connector for drive module slot 3

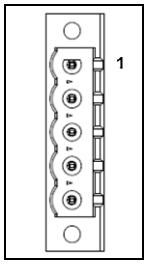


Fig. 34 NY4120 / NY4140 drive power connector (backplane) pinout

The connector pin assignment is given in Table 28. Note that the orientation of the connectors at both sides of the module housing is 180° rotated.
Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 28 Pinout NY4120 / NY4140 drive power connector

Pin	Pin name	Function
1	DR_PWR+	+ Drive power supply module x
2	DR_PWR+	+ Drive power supply module x
3	SHIELD	Cable shield
4	DR_GND	Ground drive power supply module x
5	DR_GND	Ground drive power supply module x

Note:

DR_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

6.5 NY4130 drive power connectors

The NY4130 drive power connectors are used to connect the drive power supply.

Connector type on the backplane: male, 8 pins, Phoenix, MCV 1,5/ 8-GF-3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 8-STF-3,5, order code 1847181.

The following drive power connectors are available on the backplane:

- Drive Power NY4130 0/1 : drive power connector for drive module slot 0 and 1
- Drive Power NY4130 2/3 : drive power connector for drive module slot 2 and 3

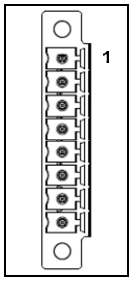


Fig. 35 NY4130 drive power connector (backplane) pinout

The connector pin assignment is given in Table 29. Note that the orientation of the connectors at both sides of the module housing is 180° rotated.
Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 29 Pinout NY4130 drive power connector

Pin	Pin name	Function
1	DRVPW+L0	+ Drive power supply for first drive module
2	DRVPW-L0	- Drive power supply for first drive module
3	DR_GND	Ground Drive power supply for first drive module
4	SHIELD	Cable shield
5	SHIELD	Cable shield
6	DR_GND	Ground Drive power supply for second drive module
7	DRVPW-L1	- Drive power supply module for second drive module
8	DRVPW+L1	+ Drive power supply module for second drive module

Note:
DR_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

6.6 Filter capacitor connectors

Connector type on the backplane: male, 2 pins, Phoenix, MCV 1,5/ 2-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 2-ST-3,5, order code 1840366.

The following filter capacitor connectors are available on the backplane:

- CAP 0 : filter capacitor connector for Drive Power 0 connection
- CAP 1 : filter capacitor connector for Drive Power 1 connection
- CAP 2 : filter capacitor connector for Drive Power 2 connection
- CAP 3 : filter capacitor connector for Drive Power 3 connection

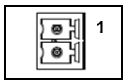


Fig. 36 Filter capacitor connector (backplane) pinout

The connector pin assignment is given in Table 30. Note that the orientation of the connectors at both sides of the module housing is 180° rotated.

Table 30 Pinout Filter capacitor connector

Pin	Pin name	Function
1	DR_PWR	+ connection of the capacitor
2	DR_GND	- connection of the capacitor

Bosch Rexroth offers a standard Filter Capacitor kit, NY4921. See for more information chapter 10.

Note:
Observe the polarity of the connection to the capacitor and the working voltage of the capacitor, if you decide to dimension the filter capacitor tailored to your motion application.

6.7 Motor connectors

Each drive module contains two motor connectors, each connector for one axis.

Connector type on the backplane: male, 8 pins, Phoenix, MSTBV 2,5/ 8-GF-5,08.

Mating connector on the cable is one of the following:

- MSTBC 2,5/ 8-STZF-5,08 order code 1809792, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C needs to be used).
- QC 1/ 8-STF-5,08 suitable for field wiring, order code 1883417.

Note:
Motor connection to NY4140 differs from motor connection to NY4120 and NY4130.

The following motor connectors are available on the backplane:

- M0.0 and M0.1 : drive module slot 0 motor 0 and motor 1 connector
- M1.0 and M1.1 : drive module slot 1 motor 0 and motor 1 connector
- M2.0 and M2.1 : drive module slot 2 motor 0 and motor 1 connector
- M3.0 and M3.1 : drive module slot 3 motor 0 and motor 1 connector

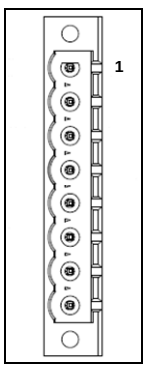


Fig. 37 Motor connector (backplane) pinout

The connector pin assignment for motor 0 of the NY4120 and NY4130, and the high voltage motor of the NY4140 is given in Table 31.

The connector pin assignment for motor 1 of the NY4120 and NY4130 is given in Table 32.

Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 31 Pinout motor Mx.0 (NY4120, NY4130, and NY4140) connectors

Pin	Pin name	Stepper motor NY4120	BLAC / BLDC motor NY4120	DC motor NY4120 NY4130	BLAC / DC motor NY4140
1	HB1+	A+		$+V_{DCmot}$	
2	HB1-	A-	U	$-V_{DCmot}$	U
3	HB2+	B+	V		
4	HB2-	B-	W		V / $+V_{DCmot}$
5	HB3-				W / $-V_{DCmot}$
6	DR_GND			Used for unbalanced motor (only on NY4130)	
7	SHIELD	Shield of motor cable			
8	PE	Protective earth of motor			

Table 32 Pinout motor Mx.1 (NY4120 and NY4130) connectors

Pin	Pin name	stepper motor NY4120	BLAC / BLDC motor NY4120	DC motor NY4120 NY4130
1	HB3+	A+		$+V_{DCmot}$
2	HB3-	A-	U	$-V_{DCmot}$
3	HB4+	B+	V	
4	HB4-	B-	W	
5		Not used		
6	DR_GND			Used for unbalanced motor (only on NY4130)
7	SHIELD	Shield of motor cable		
8	PE	Protective earth of motor		

Note:
This connector is not used in combination with an NY4140.

6.8 Encoder connectors

Each motor has its own encoder connector.
Connector type on the backplane: female, 25 pins sub-D.

The following encoder connectors are available on the backplane:

- E0.0 and E0.1 : drive module slot 0 encoder 0 and encoder 1 connector
- E1.0 and E1.1 : drive module slot 1 encoder 0 and encoder 1 connector
- E2.0 and E2.1 : drive module slot 2 encoder 0 and encoder 1 connector
- E3.0 and E3.1 : drive module slot 3 encoder 0 and encoder 1 connector

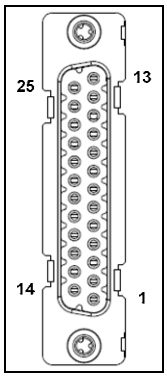


Fig. 38 Encoder Ex.0 and encoder Ex.1 connector (backplane) pinout

The connector pin assignment for the encoder connectors is given in Table 33.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 33 Pinout encoder connectors

Pin	EnDat2.2	EnDat2.1	MSM	Hiperface	Sincos	S00/S90
1	+5 Volt	+5 Volt	+5 Volt		+5 Volt	+5 Volt
2						+2.5 Volt
3						S00+
4						S90+
5						Index+
6	Clock+					Hall A+
7						Hall B+
8	Data+	Data+	Data+	Data+ (1)		Hall C+
9		Sine+		Sine+	Sine+	
10		Cosine+		Cosine+	Cosine+	
11					Index+	
12		Clock+		Data+ (1)		
13				+8 Volt		
14	0 Volt	0 Volt	0 Volt		0 Volt	0 Volt
15						S00-
16						S90-
17						Index-
18	Clock-					Hall A-
19						Hall B-
20	Data-	Data-	Data-	Data- (1)		Hall C-
21		Sine-		Sine-	Sine-	
22		Cosine-		Cosine-	Cosine-	
23					Index-	
24		Clock-		Data- (1)		
25				0 Volt		

Remark:
(1) For the Hiperface encoder cable, you must connect Data+ to pin 8 and pin 12, and connect Data- to pin 20 and pin 24.

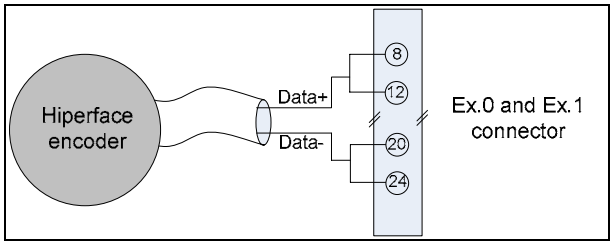


Fig. 39 Cable connection diagram for Hiperface encoders (Data signal lines)

Notes:
- Connect the shield of the cable to the shield of the sub-D connector.
- Use twisted pair cabling for the differential signals.

6.9 Fast digital I/O connectors

The fast digital I/O connector (FDIGx) is available for each drive module.
Connection type on the backplane: female, 9 pins sub-D.

The following fast digital I/O connectors are available on the backplane:

- FDIG0 : drive module slot 0 fast digital I/O connector
- FDIG1 : drive module slot 1 fast digital I/O connector
- FDIG2 : drive module slot 2 fast digital I/O connector
- FDIG3 : drive module slot 3 fast digital I/O connector

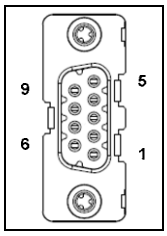


Fig. 40 Fast digital I/O connector (backplane) pinout

The connector pin assignment is given in Table 34.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 34 Pinout fast digital I/O connectors

Pin	Pin name	Function
1	GND_DIO	Ground for fast digital I/O
2	FastOut0	Fast 24 Volt Output 0
3	FastOut1	Fast 24 Volt Output 1
4	FastIn0	+ Fast 24 Volt Input 0
5	FastIn1	+ Fast 24 Volt Input 1
6	24V_DIO	24 Volt I/O supply
7	24V_DIO	24 Volt I/O supply
8	GND_DIO	Ground for digital I/O
9	GND_DIO	Ground for digital I/O

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- GND_DIO and 24V_DIO pins of the FDIGx connectors are also connected to GND_DIO and 24V_DIO pins of the DIGx connectors.

6.10 Digital I/O connectors

The digital I/O connector (DIGx) is available for each drive module.
Connector type on the backplane: male, 25 pins sub-D.

The following digital I/O connectors are available on the backplane:

- DIG0 : drive module slot 0 digital I/O connector
- DIG1 : drive module slot 1 digital I/O connector
- DIG2 : drive module slot 2 digital I/O connector
- DIG3 : drive module slot 3 digital I/O connector

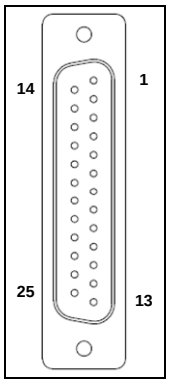


Fig. 41 Digital I/O connector (backplane) pinout

The connector pin assignment is given in Table 35.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 35 Pinout digital I/O connectors

Pin	Pin name	Function
1	DigIn0	Digital Input in group 0
2	DigIn1	Digital Input in group 0
3	DigIn2	Digital Input in group 0
4	DigIn3	Digital Input in group 0
5	DigIn4	Digital Input in group 1
6	DigIn5	Digital Input in group 1
7	DigIn6	- Digital Input in group 1, or - Stop alarm input for axis 0 in group 1 (only supported NY4120 and NY4140)
8	DigIn7	- Digital Input in group 1, or - Stop alarm input for axis 1 in group 1 (only supported NY4120)
9	GND_DIO	Ground for digital Output, connected to power supply
10	DigOut0	Digital Output
11	DigOut1	Digital Output
12	DigOut2	Digital Output
13	DigOut3	Digital Output
14	DigComm0	Common for digital Input group 0, may be ground or 24V
15	DigIn8	Digital Input in group 2 (only supported NY4130)
16	DigIn9	Digital Input in group 2 (only supported NY4130)
17	DigIn10	Stop alarm input for axis 0 in group 2 (only supported NY4130)
18	DigIn11	Stop alarm input for axis 1 in group 2 (only supported NY4130)
19	DigComm2	Common for digital Input group 2, may be ground or 24V (Note: connection to 24V only allowed if DigIn10 and DigIn11 are not used)
20	DigComm1	Common for digital Input group 1, may be ground or 24V
21	GND_DIO	Ground for digital Output, connected to power supply
22	24V_DIO	24 Volt digital Output supply
23	24V_DIO	24 Volt digital Output supply
24	24V_DIO	24 Volt digital Output supply
25	24V_DIO	24 Volt digital Output supply

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- Each pin is rated for a load of 1 A. Connect pin # 22, 23, 24, and 25 to match the total load connected to the digital output pins.
- GND_DIO and 24V_DIO pins of the DIGx connectors are also connected to GND_DIO and 24V_DIO pins of the FDIGx connectors.

6.11 Analog I/O connector

For each drive module an analog I/O connector is available.
Connector type on the backplane: male, 9 pins sub-D.

The following analog I/O connectors are available on the backplane:

- AN0 : drive module slot 0 analog I/O connector
- AN1 : drive module slot 1 analog I/O connector
- AN2 : drive module slot 2 analog I/O connector
- AN3 : drive module slot 3 analog I/O connector

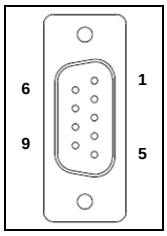


Fig. 42 Analog I/O connector (backplane) pinout

The connector pin assignment is given in Table 36.
Wiring: shielded cable, wire diameter AWG26.

Table 36 Pinout analog I/O connector

Pin	Pin name	Function
1	AnIn0+	Positive analog input +/- 10 V (differential or single ended)
2	AnIn0C	• NY4120/NY4140: Positive analog input 4-20 mA must be linked in connector to AnIn0+. • NY4130: analog reference output voltage.
3	AnIn0-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)
4	AnOut0+	Analog output
5	AnOut1+	Analog output
6	AnIn1+	Positive analog input +/- 10 V (differential or single ended)
7	AnIn1C	• NY4120/NY4140: Positive analog input 4-20 mA must be linked in connector to AnIn1+. • NY4130: analog reference output voltage.
8	AnGND	Return for analog output or 4-20 mA input, ground reference for inputs
9	AnIn1-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- Use twisted pair cabling for the differential signals (AnIn0+ / AnIn0- and AnIn1+ / AnIn1-).

7 NY4052: 5 Drive Slot System Housing

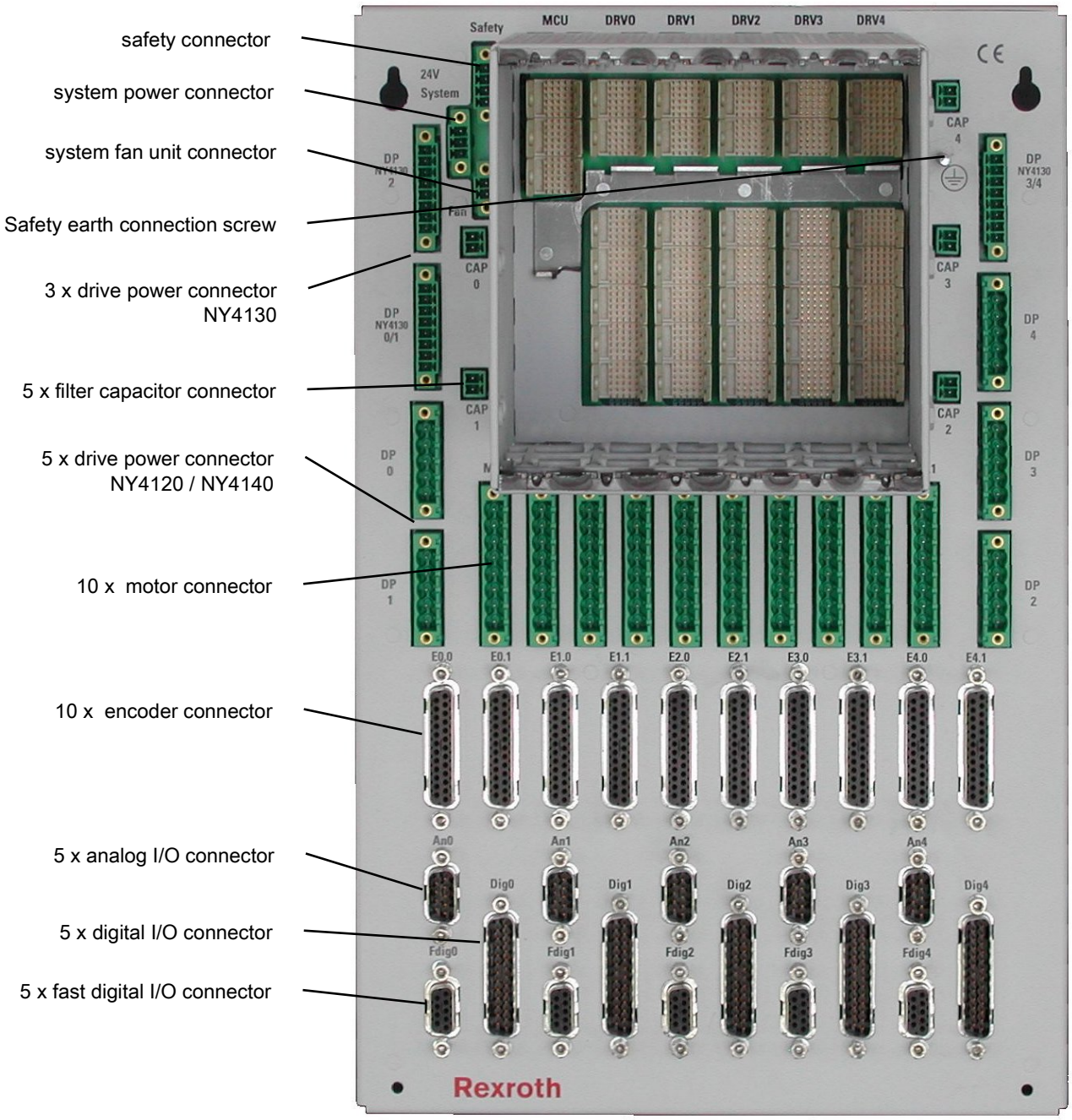


Fig. 43 NY4052 system housing

See section 16 ‘Mechanical Characteristics’ on page 136 for the dimensions of the system.

7.1 Safety input connector

Connector type on the backplane: male, 4 pins, Phoenix, MCV 1,5/ 4-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 4-STF-3,5, order code 1847071.

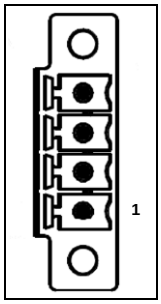


Fig. 44 Safety connector (backplane) pinout

The connector pin assignment is given in Table 37.

Table 37 Pinout Safety connector

Pin	Pin name	Function
1	SHIELD	Cable shield
2	INP_COMMON	Input common
3	INP_Safety	24 Volt input safety to MCU
4	INP_Emergency	24 Volt input emergency to MCU

7.2 24V System power connector

The main 24 Volt supply connector (24V System) that is used by the MCU module is to generate all the drive module and MCU module supply voltages.

Connector type on the backplane: male, 3 pins, Phoenix, MCV 1,5/ 3-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 3-STF-3,5, order code 1847068.

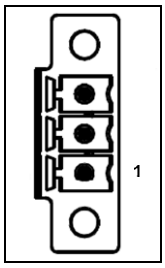


Fig. 45 24V System connector (backplane) pinout

The connector pin assignment is given in Table 38.
Wiring: shielded cable, wire diameter AWG18 (4 A).

Table 38 Pinout 24V System connector

Pin	Pin name	Function
1	24V_GND	24V common
2	+24V	System power (24 Volt DC)
3	SHIELD	Cable shield

Note:
DR_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

7.3 System fan unit connector

Connector type on the backplane: male, 2 pins, Phoenix, MCV 1,5/ 2-GF3,5.
Mating connector on the cable: Phoenix, MC 1,5/ 2-STF-3,5, order code 1847055.

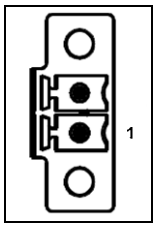


Fig. 46 Fan unit connector (backplane) pinout

The connection with the fuses on the system backplane is shown in Fig. 47, and the connector pin assignment is given in Table 39.
Wiring: unshielded cable, wire diameter AWG26.

Table 39 Pinout System fan connector

Pin	Pin name	Function
1	24V_GND	24V common (used for fan unit)
2	+24V	System power (used for fan unit)

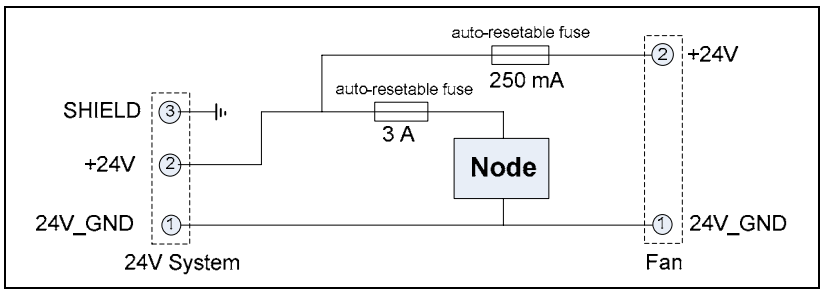


Fig. 47 Fan unit connection with auto-resetable fuse

7.4 NY4120 / NY4140 drive power connectors

The NY4120 / NY4140 drive power connectors are used to connect the drive power supply. For each drive module a separate drive power connector is available.

Connector type on the backplane: male, 5 pins, Phoenix, MSTBV 2,5/ 5-GF-5,08.

Mating connector on the cable is one of the following:

- MSTBC 2,5/ 5-STZF-5,08 order code 1809763, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C).
- QC 1/ 5-STF-5,08 suitable for field wiring, order code 1883381.

The following NY4120 / NY4140 drive power connectors are available on the backplane:

- Drive Power 0 : drive power connector for drive module slot 0
- Drive Power 1 : drive power connector for drive module slot 1
- Drive Power 2 : drive power connector for drive module slot 2
- Drive Power 3 : drive power connector for drive module slot 3
- Drive Power 4 : drive power connector for drive module slot 4

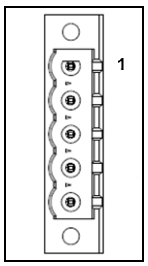


Fig. 48 NY4120 / NY4140 drive power connector (backplane) pinout

The connector pin assignment is given in Table 40. Note that the orientation of the connectors at both sides of the module housing is 180° rotated.
Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 40 Pinout NY4120 / NY4140 drive power connector

Pin	Pin name	Function
1	DR_PWR+	+ Drive power supply module x
2	DR_PWR+	+ Drive power supply module x
3	SHIELD	Cable shield
4	DR_GND	Ground drive power supply module x
5	DR_GND	Ground drive power supply module x

Note:

DR_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

7.5 NY4130 drive power connectors

The NY4130 drive power connectors are used to connect the drive power supply.
Connector type on the backplane: male, 8 pins, Phoenix, MCV 1,5/ 8-GF-3,5.
Mating connector on the cable: Phoenix, MC 1,5/ 8-STF-3,5, order code 1847181.
The following drive power connectors are available on the backplane:

- Drive Power NY4130 0/1 : drive power connector for drive module slot 0 and 1
- Drive Power NY4130 2 : drive power connector for drive module slot 2
- Drive Power NY4130 3/4 : drive power connector for drive module slot 3 and 4

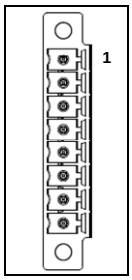


Fig. 49 NY4130 drive power connector (backplane) pinout

The connector pin assignment is given in Table 41. Note that the orientation of the connectors at both sides of the module housing is 180° rotated.
Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 41 Pinout NY4130 drive power connector

Pin	Pin name	Function
1	DRVPW+L0	+ Drive power supply for first drive module
2	DRVPW-L0	- Drive power supply for first drive module
3	DR_GND	Ground Drive power supply for first drive module
4	SHIELD	Cable shield
5	SHIELD	Cable shield
6	DR_GND	Ground Drive power supply for second drive module
7	DRVPW-L1	- Drive power supply module for second drive module
8	DRVPW+L1	+ Drive power supply module for second drive module

Note:
DR_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

7.6 Filter capacitor connectors

Connector type on the backplane: male, 2 pins, Phoenix, MCV 1,5/ 2-GF3,5.
Mating connector on the cable: Phoenix, MC 1,5/ 2-ST-3,5, order code 1840366.
The following filter capacitor connectors are available on the backplane:

- CAP 0 : filter capacitor connector for Drive Power 0 connection
- CAP 1 : filter capacitor connector for Drive Power 1 connection
- CAP 2 : filter capacitor connector for Drive Power 2 connection
- CAP 3 : filter capacitor connector for Drive Power 3 connection
- CAP 4 : filter capacitor connector for Drive Power 4 connection

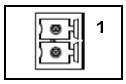


Fig. 50 Filter capacitor connector (backplane) pinout

The connector pin assignment is given in Table 42. Note that the orientation of the connectors at both sides of the module housing is 180° rotated.

Table 42 Pinout Filter capacitor connector

Pin	Pin name	Function
1	DR_PWR	+ connection of the capacitor
2	DR_GND	- connection of the capacitor

Bosch Rexroth offers a standard Filter Capacitor kit, NY4921. See for more information chapter 10.

Note:
Observe the polarity of the connection to the capacitor and the working voltage of the capacitor, if you decide to dimension the filter capacitor tailored to your motion application.

7.7 Motor connectors

Each drive module contains two motor connectors, each connector for one axis. Connector type on the backplane: male, 8 pins, Phoenix, MSTBV 2,5/ 8-GF-5,08.

Mating connector on the cable is one of the following:

- MSTBC 2,5/ 8-STZF-5,08 order code 1809792, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C needs to be used).
- QC 1/ 8-STF-5,08 suitable for field wiring, order code 1883417.

Note:
Motor connection to NY4140 differs from motor connection to NY4120 and NY4130.

The following motor connectors are available on the backplane:

- M0.0 and M0.1 : drive module slot 0 motor 0 and motor 1 connector
- M1.0 and M1.1 : drive module slot 1 motor 0 and motor 1 connector
- M2.0 and M2.1 : drive module slot 2 motor 0 and motor 1 connector
- M3.0 and M3.1 : drive module slot 3 motor 0 and motor 1 connector
- M4.0 and M4.1 : drive module slot 4 motor 0 and motor 1 connector

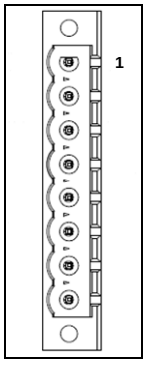


Fig. 51 Motor connector (backplane) pinout

The connector pin assignment for motor 0 of the NY4120 and NY4130, and the high voltage motor of the NY4140 is given in Table 43.

The connector pin assignment for motor 1 of the NY4120 and NY4130 is given in Table 44.

Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 43 Pinout motor Mx.0 (NY4120, NY4130, and NY4140) connectors

Pin	Pin name	Stepper motor NY4120	BLAC / BLDC motor NY4120	DC motor NY4120 NY4130	BLAC / DC motor NY4140
1	HB1+	A+		$+V_{DCmot}$	
2	HB1-	A-	U	$-V_{DCmot}$	U
3	HB2+	B+	V		
4	HB2-	B-	W		V / $+V_{DCmot}$
5	HB3-				W / $-V_{DCmot}$
6	DR_GND			Used for unbalanced motor (only on NY4130)	
7	SHIELD	Shield of motor cable			
8	PE	Protective earth of motor			

Table 44 Pinout motor Mx.1 (NY4120 and NY4130) connectors

Pin	Pin name	stepper motor NY4120	BLAC / BLDC motor NY4120	DC motor NY4120 NY4130
1	HB3+	A+		$+V_{DCmot}$
2	HB3-	A-	U	$-V_{DCmot}$
3	HB4+	B+	V	
4	HB4-	B-	W	
5		Not used		
6	DR_GND			Used for unbalanced motor (only on NY4130)
7	SHIELD	Shield of motor cable		
8	PE	Protective earth of motor		

Note:
This connector is not used in combination with an NY4140.

7.8 Encoder connectors

Each motor has its own encoder connector.
Connector type on the backplane: female, 25 pins sub-D.

The following encoder connectors are available on the backplane:

- E0.0 and E0.1 : drive module slot 0 encoder 0 and encoder 1 connector
- E1.0 and E1.1 : drive module slot 1 encoder 0 and encoder 1 connector
- E2.0 and E2.1 : drive module slot 2 encoder 0 and encoder 1 connector
- E3.0 and E3.1 : drive module slot 3 encoder 0 and encoder 1 connector
- E4.0 and E4.1 : drive module slot 4 encoder 0 and encoder 1 connector

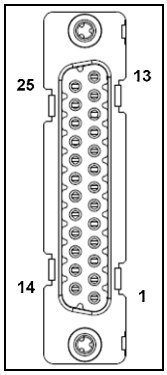


Fig. 52 Encoder Ex.0 and encoder Ex.1 connector (backplane) pinout

The connector pin assignment for the encoder connectors is given in Table 45.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 45 Pinout encoder connectors

Pin	EnDat2.2	EnDat2.1	MSM	Hiperface	Sincos	S00/S90
1	+5 Volt	+5 Volt	+5 Volt		+5 Volt	+5 Volt
2						+2.5 Volt
3						S00+
4						S90+
5						Index+
6	Clock+					Hall A+
7						Hall B+
8	Data+	Data+	Data+	Data+ (1)		Hall C+
9		Sine+		Sine+	Sine+	
10		Cosine+		Cosine+	Cosine+	
11					Index+	
12		Clock+		Data+ (1)		
13				+8 Volt		
14	0 Volt	0 Volt	0 Volt		0 Volt	0 Volt
15						S00-
16						S90-
17						Index-
18	Clock-					Hall A-
19						Hall B-
20	Data-	Data-	Data-	Data- (1)		Hall C-
21		Sine-		Sine-	Sine-	
22		Cosine-		Cosine-	Cosine-	
23					Index-	
24		Clock-		Data- (1)		
25				0 Volt		

Remark:
(1) For the Hiperface encoder cable, you must connect Data+ to pin 8 and pin 12, and connect Data- to pin 20 and pin 24.

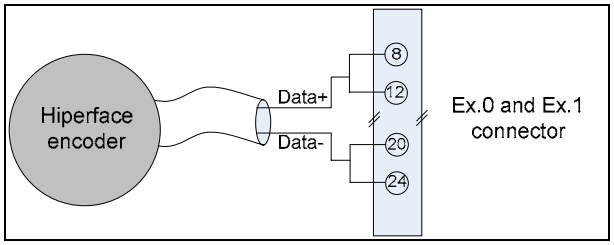


Fig. 53 Cable connection diagram for Hiperface encoders (Data signal lines)

Notes:
- Connect the shield of the cable to the shield of the sub-D connector.
- Use twisted pair cabling for the differential signals.

7.9 Fast digital I/O connectors

The fast digital I/O connector (FDIGx) is available for each drive module.
Connection type on the backplane: female, 9 pins sub-D.

The following fast digital I/O connectors are available on the backplane:

- FDIG0 : drive module slot 0 fast digital I/O connector
- FDIG1 : drive module slot 1 fast digital I/O connector
- FDIG2 : drive module slot 2 fast digital I/O connector
- FDIG3 : drive module slot 3 fast digital I/O connector
- FDIG4 : drive module slot 4 fast digital I/O connector

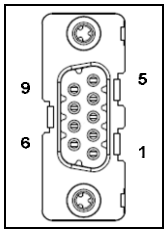


Fig. 54 Fast digital I/O connector (backplane) pinout

The connector pin assignment is given in Table 46.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 46 Pinout fast digital I/O connectors

Pin	Pin name	Function
1	GND_DIO	Ground for fast digital I/O
2	FastOut0	Fast 24 Volt Output 0
3	FastOut1	Fast 24 Volt Output 1
4	FastIn0	+ Fast 24 Volt Input 0
5	FastIn1	+ Fast 24 Volt Input 1
6	24V_DIO	24 Volt I/O supply
7	24V_DIO	24 Volt I/O supply
8	GND_DIO	Ground for digital I/O
9	GND_DIO	Ground for digital I/O

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- GND_DIO and 24V_DIO pins of the FDIGx connectors are also connected to GND_DIO and 24V_DIO pins of the DIGx connectors.

7.10 Digital I/O connectors

The digital I/O connector (DIGx) is available for each drive module.
Connector type on the backplane: male, 25 pins sub-D.

The following digital I/O connectors are available on the backplane:

- DIG0 : drive module slot 0digital I/O connector
- DIG1 : drive module slot 1 digital I/O connector
- DIG2 : drive module slot 2 digital I/O connector
- DIG3 : drive module slot 3 digital I/O connector
- DIG4 : drive module slot 4 digital I/O connector

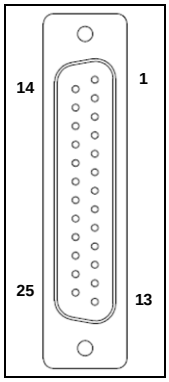


Fig. 55 Digital I/O connector (backplane) pinout

The connector pin assignment is given in Table 47.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 47 Pinout digital I/O connectors

Pin	Pin name	Function
1	DigIn0	Digital Input in group 0
2	DigIn1	Digital Input in group 0
3	DigIn2	Digital Input in group 0
4	DigIn3	Digital Input in group 0
5	DigIn4	Digital Input in group 1
6	DigIn5	Digital Input in group 1
7	DigIn6	- Digital Input in group 1, or - Stop alarm input for axis 0 in group 1 (only supported NY4120 and NY4140)
8	DigIn7	- Digital Input in group 1, or - Stop alarm input for axis 1 in group 1 (only supported NY4120)
9	GND_DIO	Ground for digital Output, connected to power supply
10	DigOut0	Digital Output
11	DigOut1	Digital Output
12	DigOut2	Digital Output
13	DigOut3	Digital Output
14	DigComm0	Common for digital Input group 0, may be ground or 24V
15	DigIn8	Digital Input in group 2 (only supported NY4130)
16	DigIn9	Digital Input in group 2 (only supported NY4130)
17	DigIn10	Stop alarm input for axis 0 in group 2 (only supported NY4130)
18	DigIn11	Stop alarm input for axis 1 in group 2 (only supported NY4130)
19	DigComm2	Common for digital Input group 2, may be ground or 24V (Note: connection to 24V only allowed if DigIn10 and DigIn11 are not used)
20	DigComm1	Common for digital Input group 1, may be ground or 24V
21	GND_DIO	Ground for digital Output, connected to power supply
22	24V_DIO	24 Volt digital Output supply
23	24V_DIO	24 Volt digital Output supply
24	24V_DIO	24 Volt digital Output supply
25	24V_DIO	24 Volt digital Output supply

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- Each pin is rated for a load of 1 A. Connect pin # 22, 23, 24, and 25 to match the total load connected to the digital output pins.
- GND_DIO and 24V_DIO pins of the DIGx connectors are also connected to GND_DIO and 24V_DIO pins of the FDIGx connectors.

7.11 Analog I/O connector

For each drive module an analog I/O connector is available.
Connector type on the backplane: male, 9 pins sub-D.

The following analog I/O connectors are available on the backplane:

- AN0 : drive module slot 0 analog I/O connector
- AN1 : drive module slot 1 analog I/O connector
- AN2 : drive module slot 2 analog I/O connector
- AN3 : drive module slot 3 analog I/O connector
- AN4 : drive module slot 4 analog I/O connector

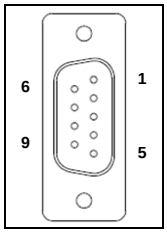


Fig. 56 Analog I/O connector (backplane) pinout

The connector pin assignment is given in Table 48.
Wiring: shielded cable, wire diameter AWG26.

Table 48 Pinout analog I/O connector

Pin	Pin name	Function
1	AnIn0+	Positive analog input +/- 10 V (differential or single ended)
2	AnIn0C	• NY4120/NY4140: Positive analog input 4-20 mA must be linked in connector to AnIn0+. • NY4130: analog reference output voltage.
3	AnIn0-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)
4	AnOut0+	Analog output
5	AnOut1+	Analog output
6	AnIn1+	Positive analog input +/- 10 V (differential or single ended)
7	AnIn1C	• NY4120/NY4140: Positive analog input 4-20 mA must be linked in connector to AnIn1+. • NY4130: analog reference output voltage.
8	AnGND	Return for analog output or 4-20 mA input, ground reference for inputs
9	AnIn1-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- Use twisted pair cabling for the differential signals (AnIn0+ / AnIn0- and AnIn1+ / AnIn1-).

8 NY4072: LMS 2 Drive Slot System Housing

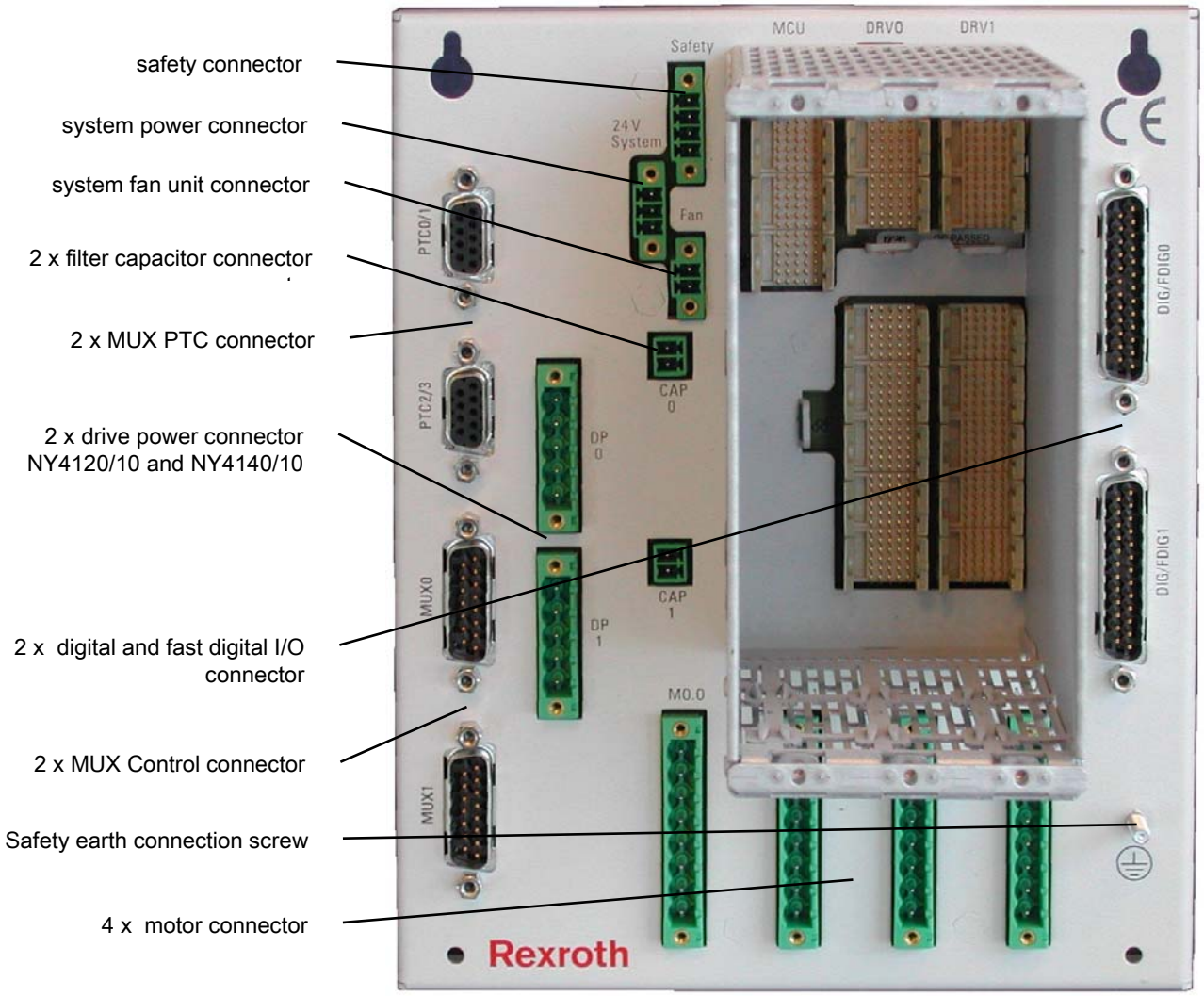


Fig. 57 NY4072 system housing

See section 16 ‘Mechanical Characteristics’ on page 136 for the dimensions of the system.

8.1 Safety input connector

Connector type on the backplane: male, 4 pins, Phoenix, MCV 1,5/ 4-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 4-STF-3,5, order code 1847071.

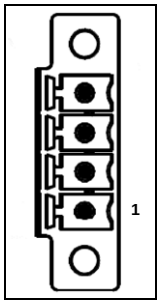


Fig. 58 Safety connector (backplane) pinout

The connector pin assignment is given in Table 49.

Table 49 Pinout Safety connector

Pin	Pin name	Function
1	SHIELD	Cable shield
2	INP_COMMON	Input common
3	INP_Safety	24 Volt input safety to MCU
4	INP_Emergency	24 Volt input emergency to MCU

8.2 24V System power connector

The main 24 Volt supply connector (24V System) that is used by the MCU module is to generate all the drive module and MCU module supply voltages.

Connector type on the backplane: male, 3 pins, Phoenix, MCV 1,5/ 3-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 3-STF-3,5, order code 1847068.

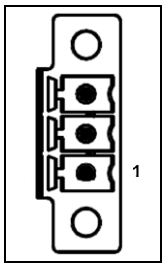


Fig. 59 24V System connector (backplane) pinout

The connector pin assignment is given in Table 50.
Wiring: shielded cable, wire diameter AWG18 (4 A).

Table 50 Pinout 24V System connector

Pin	Pin name	Function
1	24V_GND	24V common
2	+24V	System power (24 Volt DC)
3	SHIELD	Cable shield

Note:
DR_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

8.3 System fan unit connector

Connector type on the backplane: male, 2 pins, Phoenix, MCV 1,5/ 2-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 2-STF-3,5, order code 1847055.

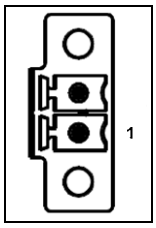


Fig. 60 Fan unit connector (backplane) pinout

The connection with the fuses on the system backplane is shown in Fig. 61, and the connector pin assignment is given in Table 51.
Wiring: unshielded cable, wire diameter AWG26.

Table 51 Pinout System fan connector

Pin	Pin name	Function
1	24V_GND	24V common (used for fan unit)
2	+24V	System power (used for fan unit)

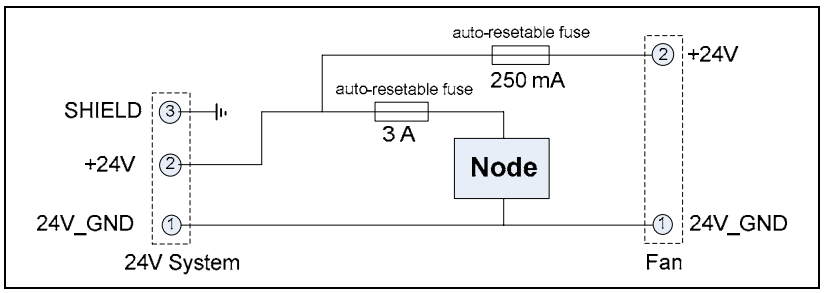


Fig. 61 Fan unit connection with auto-resetable fuse

8.4 NY4120/10 and NY4140/10 drive power connectors

The NY4120/10 and NY4140/10 drive power connectors are used to connect the drive power supply. For each drive module a separate drive power connector is available.

Connector type on the backplane: male, 5 pins, Phoenix, MSTBV 2,5/ 5-GF-5,08.

Mating connector on the cable is one of the following:

- MSTBC 2,5/ 5-STZF-5,08 order code 1809763, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C).
- QC 1/ 5-STF-5,08 suitable for field wiring, order code 1883381.

The following NY4120/10 and NY4140/10 drive power connectors are available on the backplane:

- Drive Power 0 : drive power connector for drive module slot 0
- Drive Power 1 : drive power connector for drive module slot 1

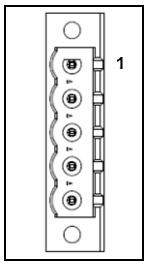


Fig. 62 NY4120/10 and NY4140/10 drive power connector (backplane) pinout

The connector pin assignment is given in Table 52.
Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 52 Pinout NY4120/10 and NY4140/10 drive power connector

Pin	Pin name	Function
1	DR_PWR+	+ Drive power supply module x
2	DR_PWR+	+ Drive power supply module x
3	SHIELD	Cable shield
4	DR_GND	Ground drive power supply module x
5	DR_GND	Ground drive power supply module x

Note:
DR_GND must be connected to the same potential as SHIELD (safety ground), not at the node side of the cable, but at the power supply.

8.5 Filter capacitor connectors

Connector type on the backplane: male, 2 pins, Phoenix, MCV 1,5/ 2-GF3,5.

Mating connector on the cable: Phoenix, MC 1,5/ 2-ST-3,5, order code 1840366.

The following filter capacitor connectors are available on the backplane:

- CAP 0 : filter capacitor connector for Drive Power 0 connection
- CAP 1 : filter capacitor connector for Drive Power 1 connection

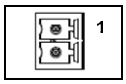


Fig. 63 Filter capacitor connector (backplane) pinout

The connector pin assignment is given in Table 53.

Table 53 Pinout Filter capacitor connector

Pin	Pin name	Function
1	DR_PWR	+ connection of the capacitor
2	DR_GND	- connection of the capacitor

Bosch Rexroth offers a standard Filter Capacitor kit, NY4921. See for more information chapter 10.

Note:
Observe the polarity of the connection to the capacitor and the working voltage of the capacitor, if you decide to dimension the filter capacitor tailored to your motion application.

8.6 Motor connectors

Each drive module contains two motor connectors, each connector for one axis.

Connector type on the backplane: male, 8 pins, Phoenix, MSTBV 2,5/ 8-GF-5,08.

Mating connector on the cable is one of the following:

- MSTBC 2,5/ 8-STZF-5,08 order code 1809792, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C).
- QC 1/ 8-STF-5,08 suitable for field wiring, order code 1883417.

Note:
Motor connection to NY4140/10 differs from motor connection to NY4120/10.

The following motor connectors are available on the backplane:

- M0.0 and M0.1 : drive module slot 0 motor 0 and motor 1 connector
- M1.0 and M1.1 : drive module slot 1 motor 0 and motor 1 connector

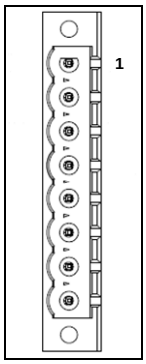


Fig. 64 Motor connector (backplane) pinout

The connector pin assignment for motor 0 of the NY4120/10 and NY4140/10 is given in Table 54.

The connector pin assignment for motor 1 of the NY4120/10 is given in Table 55.
Wiring: shielded cable, wire diameter AWG14 (10 A).

Table 54 Pinout motor 0 (NY4120/10 and NY4140/10) connectors

Pin	Pin name	BLDC / BLAC motor NY4120/10	BLDC / BLAC motor NY4140/10
1	HB1+	Not used	
2	HB1-	U	U
3	HB2+	V	
4	HB2-	W	V
5	HB3-		W
6	DR_GND	Servo power ground	
7	SHIELD	Shield of motor cable	
8	PE	Protective earth of motor	

Table 55 Pinout motor 1 (NY4120/10 only) connectors

Pin	Pin name	BLDC / BLAC motor NY4120/10
1	HB3+	Not used
2	HB3-	U
3	HB4+	V
4	HB4-	W
5		Not connected
6	DR_GND	Servo power ground
7	SHIELD	Shield of motor cable
8	PE	Protective earth of motor

Note:
This connector is not used in combination with an NY4140/10.

8.7 NY4960 LMS MUX PTC connectors

Each drive slot has its own connector to connect the PTCs.
Connector type on the backplane: female, 9 pins sub-D.
The following PTC connectors are available on the backplane:

- PTC 0/1 : drive module slot 0 MUX PTC connector
- PTC 2/3 : drive module slot 1 MUX PTC connector

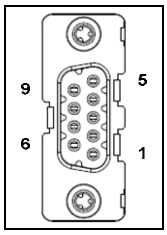


Fig. 65 LMS MUX PTC connector (backplane) pinout

The connector pin assignment is given in Table 56.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 56 Pinout LMS MUX PTC connectors

Pin	Pin name	MUX PTC connections
1	DigIn6	MxTok0+ signal , coil 0/2 PTC
2	DigIn7	MxTok1+ signal , coil 1/3 PTC
3		Not connected
4		Not connected
5		Not connected
6	DigComm1	MxTok_gnd , ground
7		Not connected
8		Not connected
9		Not connected

Note:
Connect the shield of the cable to the shield of the sub-D connector.

8.8 NY4960 LMS MUX Control connectors

Each drive slot has its own connector to connect the MUX Control signals.
Connector type on the backplane: male, 15 pins sub-D.
The following Control connectors are available on the backplane:

- MUX 0 : drive module slot 0 MUX Control connector
- MUX 1 : drive module slot 1 MUX Control connector

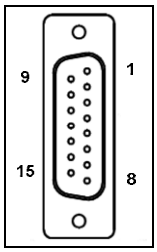


Fig. 66 LMS MUX Control connector (backplane) pinout

The connector pin assignment is given in Table 57.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 57 Pinout LMS MUX Control connectors

Pin	Pin name	MUX Control connections
1	Dig5VIn0a+	Mxsel0+ , selection line 0 differential signal + (output)
2	Dig5VIn0b+	Mxsel1+ , selection line 1 differential signal + (output)
3	Dig5VIn0c+	Mxsel2+ , selection line 2 differential signal + (output)
4	EncGND	Mxsel_gnd , ground digital selection lines
5	AnIn0+	MxA0_in+ , analog output 0 differential input +
6	AnGND	MxA0_in0 , analog ground 0
7	AnGND	MxA1_in0 , analog ground 1
8	AnIn1+	MxA1_in+ , analog output 1 differential input +
9	Dig5VIn0a-	Mxsel0- , selection line 0 differential signal – (output)
10	Dig5VIn0b-	Mxsel1- , selection line 1 differential signal – (output)
11	Dig5VIn0c-	Mxsel2- , selection line 2 differential signal – (output)
12		Not used
13	AnIn0-	MxA0_in– , analog input 0 differential input –
14		Not used
15	AnIn1-	MxA1_in– , analog output 1 differential input –

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- Use twisted pair cabling for the differential signals.

8.9 Digital and fast digital I/O connectors

The digital and fast digital I/O connector ((F)DIGx) is available for each drive module.
Connector type on the backplane: male, 25 pins sub-D.

The following digital I/O connectors are available on the backplane:

- (F)DIG0 : drive module slot 0 digital and fast digital I/O connector
- (F)DIG1 : drive module slot 1 digital and fast digital I/O connector

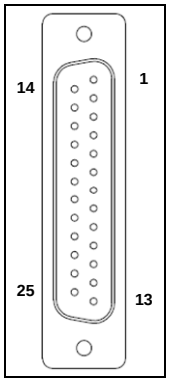


Fig. 67 Digital and fast digital I/O connector (backplane) pinout

The connector pin assignment is given in Table 58.
Wiring: shielded cable, wire diameter AWG20 (2 A).

Table 58 Pinout digital and fast digital I/O connectors

Pin	Pin name	Function
1	DigIn0	Digital Input 0 in group 0
2	DigIn1	Digital Input 1 in group 0
3	DigIn2	Digital Input 2 in group 0
4	DigIn3	Digital Input 3 in group 0
5		Not connected
6		Not connected
7	FastIn0	Fast digital input 0
8	FastIn1	Fast digital input 1
9	GND_DIO	Ground for digital output, connected to power supply
10	DigOut0	Digital Output
11	DigOut1	Digital Output
12	DigOut2	Digital Output
13	DigOut3	Digital Output
14	DigComm0	Common for digital Input group 0, may be ground or 24V
15		Not connected
16		Not connected
17	FastOut0	Fast digital output 0
18	FastOut1	Fast digital output 1
19		Not connected
20		Not connected
21	GND_DIO	Ground for digital output, connected to power supply
22	24V_DIO	24 Volt digital (fast) output supply
23	24V_DIO	24 Volt digital (fast) output supply
24	24V_DIO	24 Volt digital (fast) output supply
25	24V_DIO	24 Volt digital (fast) output supply

Notes:

- Connect the shield of the cable to the shield of the sub-D connector.
- Each pin is rated for a load of 1 A. Connect pin # 22, 23, 24, and 25 to match the total load connected to the digital output pins.

9 NY4901 Strain Relief

The NY4110 Motion Control Unit uses FireWire connections to connect to other nodes and the host. The NY4901 strain relief is developed, because FireWire connectors do not support a locking mechanism.

The NY4901 strain relief consists of a bracket, a lock washer and a screw.

Fig. 68 NY4901 strain relief, bracket, lock washer and screw

Installation of the NY4901 strain relief on an NY4110

When you look at the front of the NY4110, the large plate of the bracket is at the left side of the NY4110. First, you hook the lower corner of the bracket (the corner shown at the right side in Fig. 68) on the bottom end of the NY4110 at an angle of approximately 60°. Place the bracket against the front of the NY4110, and install the bracket with the lock washer and the screw.

You can secure the connections of the FireWire connector(s) to the MCU with the NY4901 using a tie-wrap around the cable and the holes in the NY4901 bracket, see Fig. 69.

Fig. 69 FireWire cable attached to the NY4901 Strain Relief on the NY4110 MCU

10 NY4916/10 Host adapter

The NY4916/10 is a card with a PCI interface to install in a PCI slot of a PC. The NY4916/10 host adapter facilitates the connection of a host PC to the NY4111 MCU module using a shielded Cat-5e or Cat-6 cable with RJ45 connectors or FireWire cable with FireWire connectors. The RJ45 connections and the FireWire connection can be used at the same time to communicate with connected nodes.

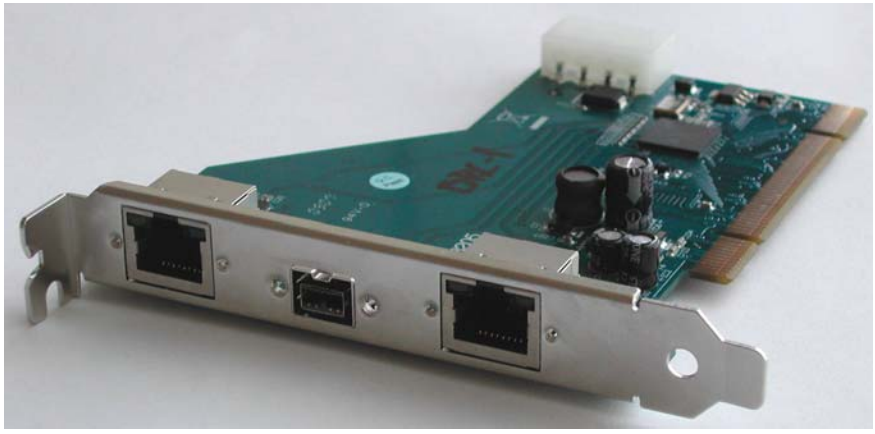


Fig. 70 NY4916/10 host adapter

NY4916/10 main features:

- Standard PCI interface for installation in any PCI slot of a modern PC.
- One FireWire interface connector for IEEE 1394b cable length up to 4.5 meter.
- Two RJ45 interface connectors.
  - Use “crossed STP” Cat-5e cable for lengths ≤ 20 meter.
  - Use “crossed STP” Cat-6 cable for lengths > 20 meter and ≤ 50 meter.
- Widely available standard crossed Ethernet cabling.
- IEC60950 compliant (to be tested).

Table 59 shows the standard Ethernet cable pin definition and its use for IEEE 1394b communication. With this pin assignment the connection between the NY4916/10 host adapter card and the NY4111 MCU must always be a crossed cable.

Table 59 Connector pin assignment and wire color coding

connector 1 pin number	connector 2 pin number	Wire color	Wire diagram	10Base-T 100Base-T	IEEE 1394b
1	3	White/orange		Transmit +	TPB +
2	6	Orange		Transmit -	TPB -
3	1	White/green		Receive +	TPA +
4	7	Blue		Not used	Not connected
5	8	White/blue		Not used	Not connected
6	2	Green		Receive -	TPA -
7	4	White/brown		Not used	Not connected
8	5	Brown		Not used	Not connected

The crossed Ethernet cable is defined as shown in Fig. 71.

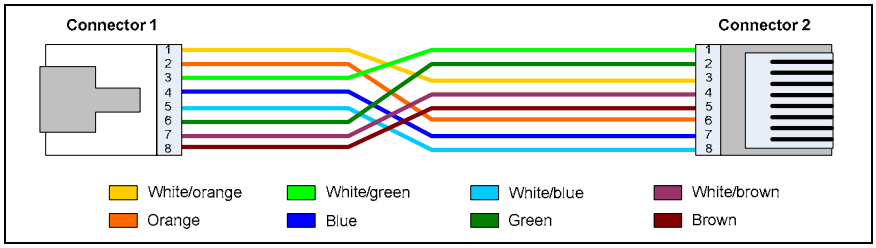


Fig. 71 Crossed Ethernet cable wiring

10.1 Field diagnostics

Both RJ45 connectors on the NY4916/10 include the standard green link contact indicator LED. The green LED indicates the connection to the IEEE 1394b link layer. The yellow LED of the RJ45 connectors is not used.

11 NY4921 Filter Capacitor kit

The NYCe4000 drive modules NY4120, NY4140 and NY4120/10, NY4140/10 need an extra capacitor with a low ESR (Equivalent Series Resistance) for optimal functionality at high currents. The capacitor is needed to reduce the ripple on the supply voltage during the PWM switching cycles.

To prevent touching the contacts of the capacitor an encapsulation is supplied. The encapsulation does not cover the overpressure valve of the capacitor.

Each capacitor kit consists of a capacitor unit with a cable and a Phoenix connector, a clamp and two screws M3x4 to install the clamp on the standard system housing, see Fig. 72.

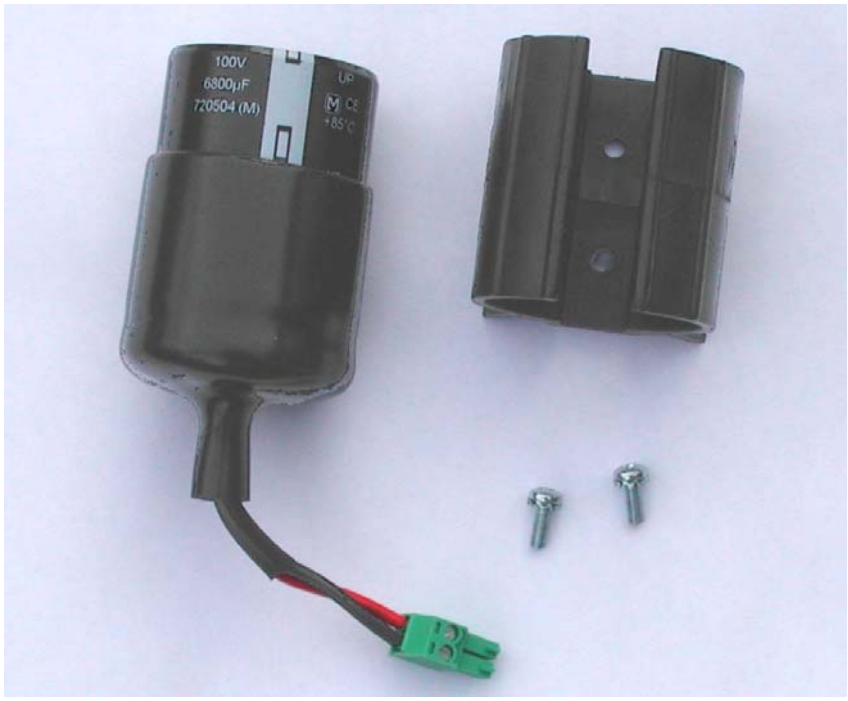


Fig. 72 NY4921 capacitor kit

Different capacitor kits are available for the NY4120, NY4120/10 and the NY4140, NY4140/10 drive module, see Table 60.

Table 60 Capacitor kits for the NY4120 and NY4140 drive modules

Drive module	Capacitor kit	Specifications
NY4120 NY4120/10	NY4921/00	Capacity: 6800 µF Working voltage : 100 Volt Surge voltage : 125 Volt DC
NY4140 NY4140/10	NY4921/10	Capacity : 2200 µF Working voltage : 200 Volt Surge voltage : 250 Volt DC

A 2-pin Phoenix connector (MC 1,5/ 2-STF-3,5) is installed at the end of the wires, pin #1 connects the “+”, and pin #2 connects the “-“ of the capacitor. Pin #1 of the connector is at the right-hand side when you look at the connector with the terminal screws visible and the connector pins point downwards. See also Fig. 72.

Installation

The capacitor must be installed as close as possible to the drives. For this purpose the I/O backplane in the standard system housings (NY4012, NY4042, NY4052, and NY4072) have dedicated connector(s) (labelled CAPx) to connect the capacitor(s). The system housing has holes with M3 threading at both sides to install the clamp(s) against the system housing with two M3 screws, length 4 mm.

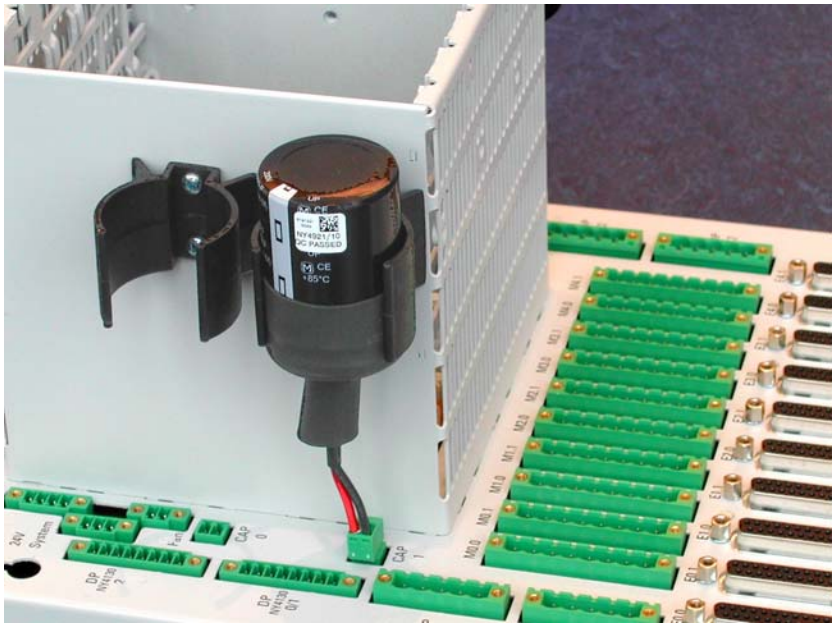


Fig. 73 Example of an installed NY4921/10 on the NY4052 system housing

There is no proper solution available for the mounting of the capacitor on the legacy system housings (NY4010, NY4040, and NY4050). It is essential that the wiring from the power connector to the capacitor is short.
The following steps provide a possible solution. Remove the Phoenix connector from the NY4921, shorten the wires as much as possible and connect them to the drive power connector of the NY4120/NY4140. See Fig. 74.

Fig. 74 Electrolytic capacitor with NY4040 system housing

12 NY4930 Brake Unit

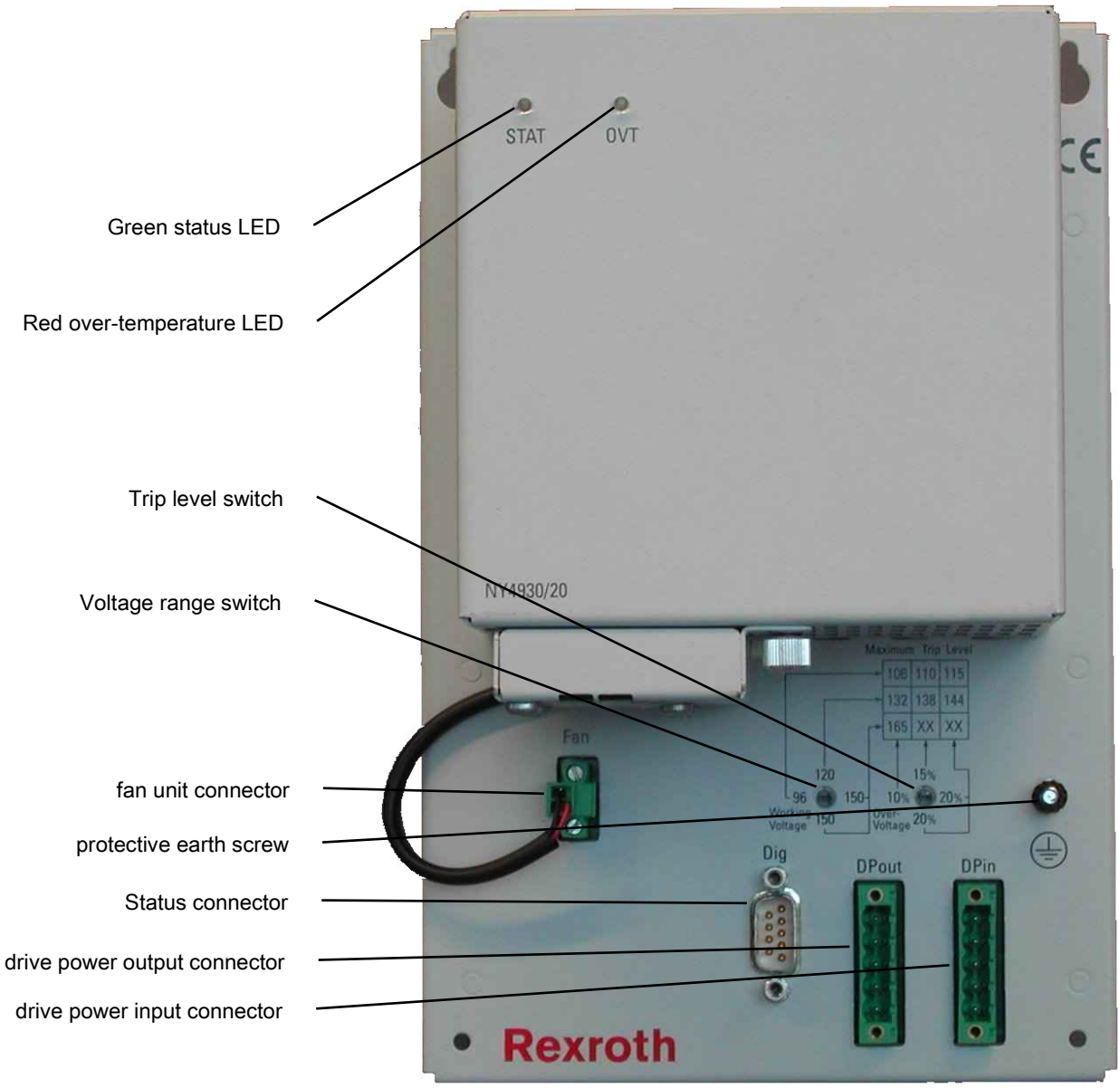


Fig. 75 NY4930/20 Brake Unit, with NY4922/10 fan unit

See section 16 ‘Mechanical Characteristics’ on page 136 for the dimensions of the system.

NY4930 main features:

- drive power feed-through of 20 A DC for easy connectivity
- dissipation limiting circuits to prevent self-destruction
- digital status output signals and LED status indication
- parallel connection of more Brake Units possible to support higher dissipation levels

12.1 Introduction

When a motor is decelerated by the NYCe4000 motion control system, mechanical energy is converted into electrical energy. This conversion is called regeneration. A part of this regeneration energy is lost to friction in the mechanical system, and converted into heat due to I^2R losses in the motor windings, cabling and drive module electronics. The rest of the regeneration energy is added to the electrical energy already stored in the internal capacitors of the system (drive power supply, drive module, optional installed capacitors). This regeneration energy causes an increase of the voltage level of these capacitors. If too much energy is added to the capacitors in the system, the drive voltage can increase to a level where the over-voltage detection of the drive module will shut down the drive. If the voltage level increases above the absolute maximum voltage rating, damage to the drive power supply and/or the drive module may occur.

The Brake Unit is a standalone module in the NYCe4000 system. The Brake Unit includes a capacitor to store regeneration energy, and has a control circuit that shunts some of the regeneration energy into a resistor if the voltage level increases too much. The Brake Unit is only needed in a system with NY4120 and/or NY4140 drive modules.

Three different models of the NY4930 are available to cover a wide range of drive power supply voltages.

12.2 Functional description

The NY4930 has a large capacitor C at the input to buffer energy and filter outgoing pulses. A user-selectable switch sets the factor for the drive voltage divider. An internal circuit measures the temperature. The drive voltage and the temperature are compared. The output of the comparator generates the so-called dissipation signal, and this signal can turn the FET on and off. The regeneration energy is dissipated in the high-dissipation resistor R when the FET is turned on. See the (simplified) schematic in Fig. 76.

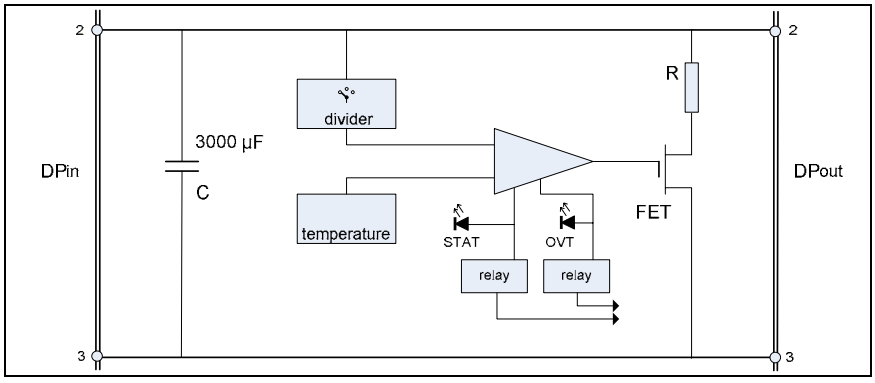


Fig. 76 Functional diagram of the NY4930

Two status signals are available to notify the system of the state of the Brake Unit. One output provides the functional status, and the other output signals the temperature status. The output signals are created with relay contacts and thus electrically isolated. The output signals are also visible via LEDs on the Brake Unit.

The Brake Unit can be in 4 different states.

State 1

The Brake Unit is in state 1 when no regeneration energy or little regeneration energy is generated. The Brake Unit will not dissipate any energy for this reason. In this state, capacitors store the regenerated energy.

State 2

In this state, the Brake Unit dissipates regenerated energy. The increase of the temperature inside the Brake Unit is a measurement for the amount of dissipation. This method enables a dissipation load balancing when more Brake Units are connected in parallel.

State 3

The Brake Unit controls the amount of dissipation to the maximum. The Brake Unit sets the dissipation to the maximum level and activates the “almostOVH” signal output. It is the responsibility of the application to switch off or use motion profiles with smaller deceleration values when this state is reached. The Brake Unit measures the temperature inside the unit to prevent damage to the unit.

State 4

The temperature has increased to the maximum level. The Brake Unit stops the dissipation of regenerated energy. Note that the Brake Unit does not operate as a "circuit breaker" in failure or overload conditions. When the temperature drops below “maximum temperature minus 10%”, the Brake Unit will revert to normal operation.

State 5 (only on NY4930/00)

The Brake Unit detects an over voltage condition, but no over temperature condition. In this state, the Brake Unit does not dissipate any energy. The green STAT LED is off and the red OVT LED flashes. The potential-free contacts “status” and “almostOVH” are open.

12.3 Drive voltage ranges

Three different models of the NY4930 Brake Unit are developed to support several drive voltage levels. The NY4930 Brake Unit includes a 4-position switch with 3 different settings to adjust to the used drive voltage level, see Table 61.

Table 61 The available NY4930 models and drive voltage ranges

Brake Unit model	Drive voltage range setting 1	Drive voltage range setting 2	Drive voltage range setting 3
NY4930/00	15 V	24 V	36 V
NY4930/10	48 V	60 V	72 V
NY4930/20	96 V	120 V	150 V

In addition to the 3 selectable working drive voltage level ranges, the NY4930 Brake Unit has another 4-position switch to set 3 different maximum voltage levels. The allowed maximum voltage levels are 10%, 15% and 20% above the selected working drive voltage level.

12.4 Diagnostics

When power is applied to the Brake Unit, the status output is activated and the unit operates in state 1. The regeneration energy causes an increase of the drive voltage. As long as the increase of the drive voltage is less than a certain percentage the Brake Unit operates in state 1.
If the drive voltage increases more, the Brake Unit operates in state 2 and dissipates energy in the resistor. The amount of dissipated energy depends on the measured temperature. The dissipation causes a temperature increase inside the unit. If the temperature exceeds the specified maximum temperature minus 10%, the almostOVH output is activated. The application can use this signal to switch off or use motion profiles with smaller deceleration values.

If the temperature exceeds the specified maximum value, the Brake Unit stops the energy dissipation to prevent damage to the unit and deactivates the status output to signal this condition.
The two status conditions are reported by separate potential-free contacts, “status” and “almostOVH” (see Fig. 77 and Fig. 78) and the diagnostic LEDs on the front of the housing (see Fig. 79 and Table 62).

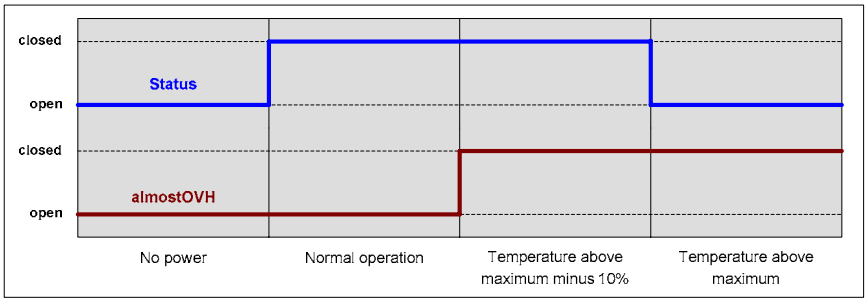


Fig. 77 State of the potential-free contacts

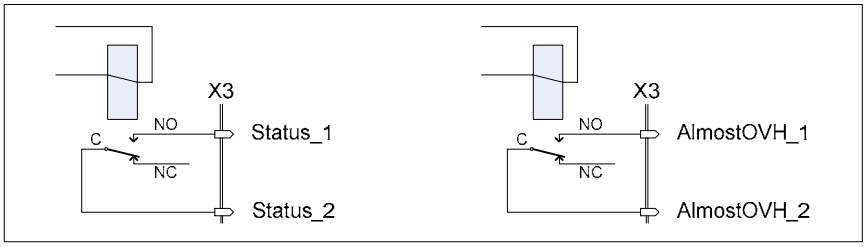


Fig. 78 Diagram of the potential-free contacts for the status signals

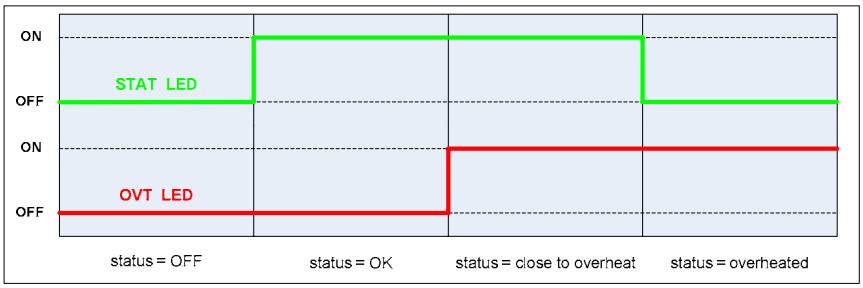


Fig. 79 Diagnostic “STAT” and “OVT” LED relation to NY4930 state

Table 62 Status and over-temperature LED indications

LED indication	Description
Green status LED “STAT”	▪ ON : the module is operating ▪ OFF : no power, or module switched off, due to over-temperature condition (OVT LED is ON)
Red over-temperature LED “OVT”	▪ OFF : status OK ▪ ON : the internal temperature is above maximum minus 10° K. If the green LED is OFF, the module is above the maximum operating temperature, and has shut down. ▪ Flashing (only on NY4930/00) : over voltage condition but no over temperature condition

12.5 Connections

The NY4930 Brake Unit has 4 connectors.

- DPin - Drive power supply input
- DPout - Drive power supply output
- Dig - Status output
- Fan - Fan Unit power

DPin – Drive power supply input

Connector type on the Brake Unit: male, 5 pins, Phoenix, MSTBV 2,5/ 5-GF-5,08 connector.
Mating connector on the cable is one of the following:

- MSTBC 2,5/ 5-STZF-5,08 order code 1809763, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C).
- QC 1/ 5-STF-5,08 suitable for field wiring, order code 1883381.

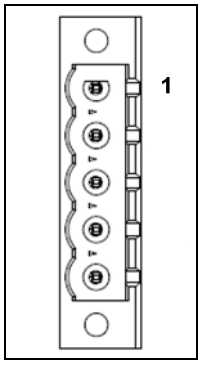


Fig. 80 Drive power supply input connector on the Brake Unit

Table 63 Pinout drive power supply input connector

Pin	Pin name	Function
1	Power	Power supply (15 V … 150 V)
2	Power	Power supply (15 V … 150 V)
3	Shield	Shielding
4	Ground	Ground (0 V)
5	Ground	Ground (0 V)

DPout – Drive power supply output

Connector type on the Brake Unit: male, 5 pins, Phoenix, MSTBV 2,5/ 5-GF-5,08 connector.
Mating connector on the cable is one of the following:

- MSTBC 2,5/ 5-STZF-5,08 order code 1809763, provided with crimp barrels MSTBC-MT 1,5-2,5 order code 3190551 suitable for factory wiring only, rated 300V, 10A (exception 36.9.3 in UL 508C).
- QC 1/ 5-STF-5,08 suitable for field wiring, order code 1883381.

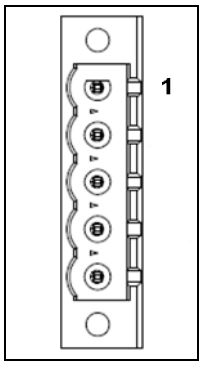


Fig. 81 Drive power supply output connector on the Brake Unit

Table 64 Pinout drive power supply output connector

Pin	Pin name	Function
1	Power	Power supply (15 V … 150 V)
2	Power	Power supply (15 V … 150 V)
3	Shield	Shielding
4	Ground	Ground (0 V)
5	Ground	Ground (0 V)

Dig – Status output

Connector type on the Brake Unit: male, 9 pins sub-D.

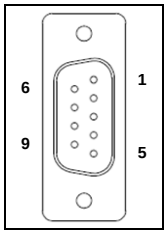


Fig. 82 Status output connector on the Brake Unit

Table 65 Pinout status output connector

Pin	Pin name	Function
1	Status_1	Status Output
2 ,3 , 4		Not connected
5	AlmostOVH_1	Temperature Output
6	Status_2	Status Output
7 , 8		Not connected
9	AlmostOVH_2	Temperature Output

Fan – Fan Unit power

Connector type on the Brake Unit: male, 2 pins, Phoenix, MCV 1,5/ 2-GF3,5 for connection of an optional NY4922 Fan Unit.
Mating connector on the cable: Phoenix, MC 1,5/ 2-STF-3,5, order code 1847055.

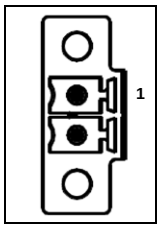


Fig. 83 Fan unit connector on the Brake Unit

Table 66 Pinout Fan unit connector

Pin	Pin name	Function
1	24V_GND	24V common (used for fan unit)
2	+24V	System power (used for fan unit)

12.6 Installation

The position of the Brake Unit in a NYCE4000 system is shown in Fig. 84.

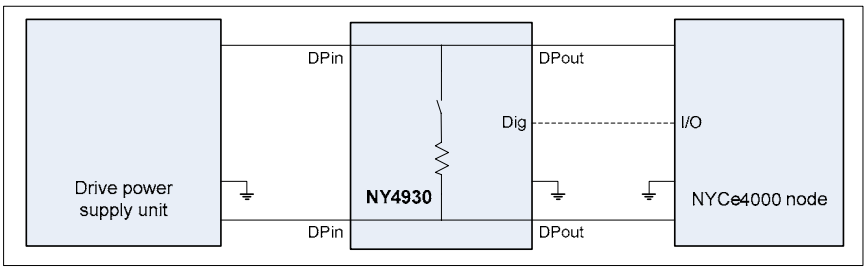


Fig. 84 Position of the NY4930 in the NYCe4000 system

- See chapter 12.5 for the connections of the NY4930 Brake Unit.
- Make sure that you connect an appropriate cable to the Protective Earth connection screw. Use a toothed washer between the housing and the cable connection to guarantee a good electrical connection, see also chapter 18.
- The airflow goes through the Brake Unit from the bottom to the top. Make sure that cables do not obstruct the free flow of air.
- If convection cooling is not sufficient, you can install forced cooling using the NY4922 Fan Unit.

Adjustment of working voltage range and over-voltage range

On the front of the NY4930 Brake Unit are 2 rotary switches. Looking at the front of the NY4930, the rotary switch at the left side is the working voltage range selector, and the rotary switch at the right side is the over-voltage range selector. Both switches have 4 positions. On the working voltage range selector the highest voltage range is available on 2 positions, and on the over-voltage range selector the highest over-voltage range setting is available on 2 positions. Fig. 85 shows the selectors for the NY4930/20. The working voltage range selector settings are different for the different NY4930 models. The over-voltage range selector settings are identical for all NY4930 models.

The working voltage selector is set to the used drive voltage.

The over-voltage selector sets the maximum allowable over voltage (increased due to regeneration energy) when the Brake Unit starts operation in state 4, see chapter 12.2.
At a working voltage of 150 Volt the 15% and 20% over-voltage settings are not allowed, because 165 Volt is the maximum allowed voltage. This only applies to the NY4930/20.

Note:
Change a switch setting only while power is switched off.

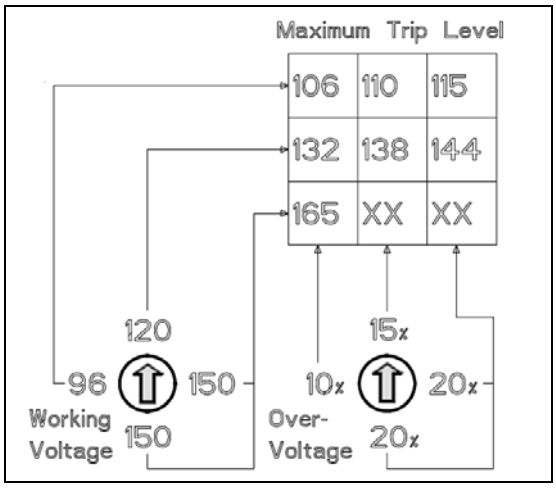


Fig. 85 Positions of the rotary switches for drive voltage and over-voltage range

12.7 Expansion possibility

In the condition that one NY4930 Brake Unit is not sufficient to dissipate the produced regeneration energy of the NYCe4000 system, you can connect Brake Units in parallel. The parallel connection can be realized in 2 methods, depending on the total current from the drive power supply to the NYCe4000 system. For total currents below 20 A continuous, a feed-through connection is possible for easy cable wiring, as shown in Fig. 86.

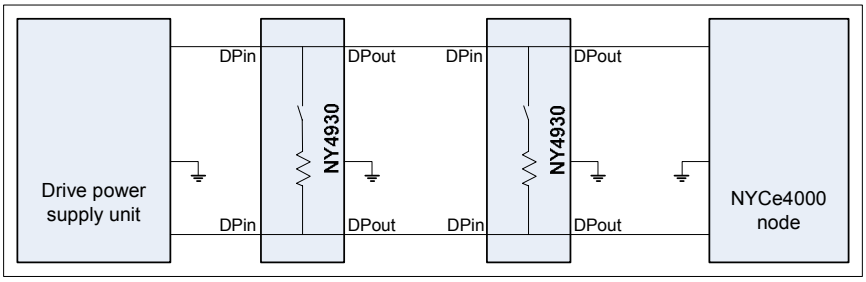


Fig. 86 Parallel connection for currents < 20 A continuous

If the total current is higher than 20 A continuous, no feed-through connection is possible, and the cable wiring must be solved in the machine cabling outside the Brake Unit, as shown in Fig. 87.

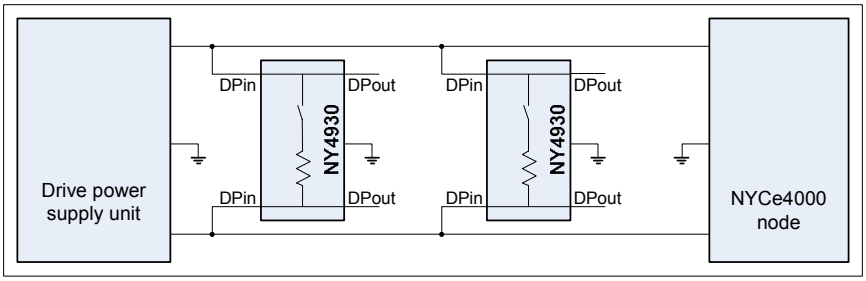


Fig. 87 Parallel connection for currents > 20 A continuous

In both figures only 2 Brake Units are drawn, but to meet the required dissipation you can connect more Brake Units in parallel.

A Brake Unit can dissipate up to 170 Watt if the unit has forced cooling. Table 67 gives the maximum total dissipation for up to 5 Brake Units connected in parallel, if forced cooling is used. Due to a 3% tolerance between the units a safety margin is incorporated in the specified maximum dissipation values.

Table 67 Maximum dissipation for NY4930's connected in parallel

n (units in parallel)	Total maximum dissipation P_{total}
1	170
2	330
3	490
4	649
5	809

Due to the accuracy of the voltage-based trip levels of a Brake Unit, the impedance of the cabling must be taken in consideration to distribute the energy evenly over the parallel connected Brake Units, see Fig. 88.

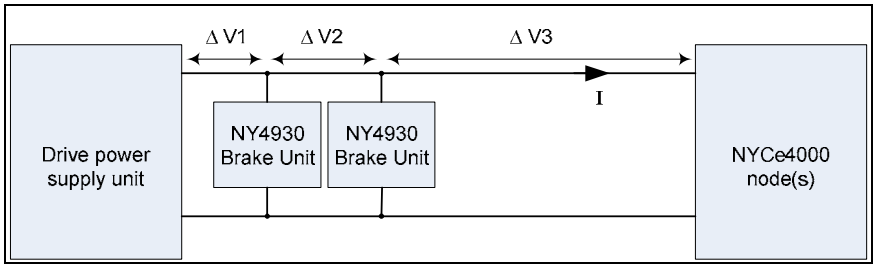


Fig. 88 Positioning of parallel connected Brake Units

Make sure that the voltage drop in the cabling between Brake Units (ΔV2) is as low as possible otherwise the energy dissipation is not balanced over the units.

The device protected by the Brake Unit(s) must be close to the Brake Unit else the voltage drop across the cabling must be taken into account to determine the maximum voltage. It is advised to install the Brake Unit as close as possible to the most critical component to be protected in the system. If the power supply must be protected, install the Brake Unit near the power supply (minimize ΔV1). If the drive module must be protected, install the Brake Unit near the node (minimize ΔV3).

12.8 Specifications

Table 68 NY4930 specifications

	Typical (1)	Max
Maximum outer surface temperature on enclosure (see also chapter 18)	65 °C	95 °C
Input capacitor	3000 µF	
Servo voltage input		
- NY4930/00		
Voltage range 1	15 V	18 V
Voltage range 2	24 V	29 V
Voltage range 3	36 V	43 V
Absolute maximum rating		90 V
- NY4930/10		
Voltage range 1	48 V	56 V
Voltage range 2	60 V	72 V
Voltage range 3	72 V	86 V
Absolute maximum rating		90 V
- NY4930/20		
Voltage range 1	96 V	115 V
Voltage range 2	120 V	144 V
Voltage range 3	150 V	165 V
Absolute maximum rating		180 V
Feed-through current		20 A continuous
Power dissipation		
- convection cooled		40 W
- forced cooled		170 W
Signalling output contacts		
maximum switching voltage		30 V DC
maximum switching current		1 A
contact resistance (measured at 1 V DC, 10 mA)		100 mΩ max

(1) Typical temperature values are specified at 25° C operating temperature.

13 Legacy NY4010: 1 Drive Slot System Housing

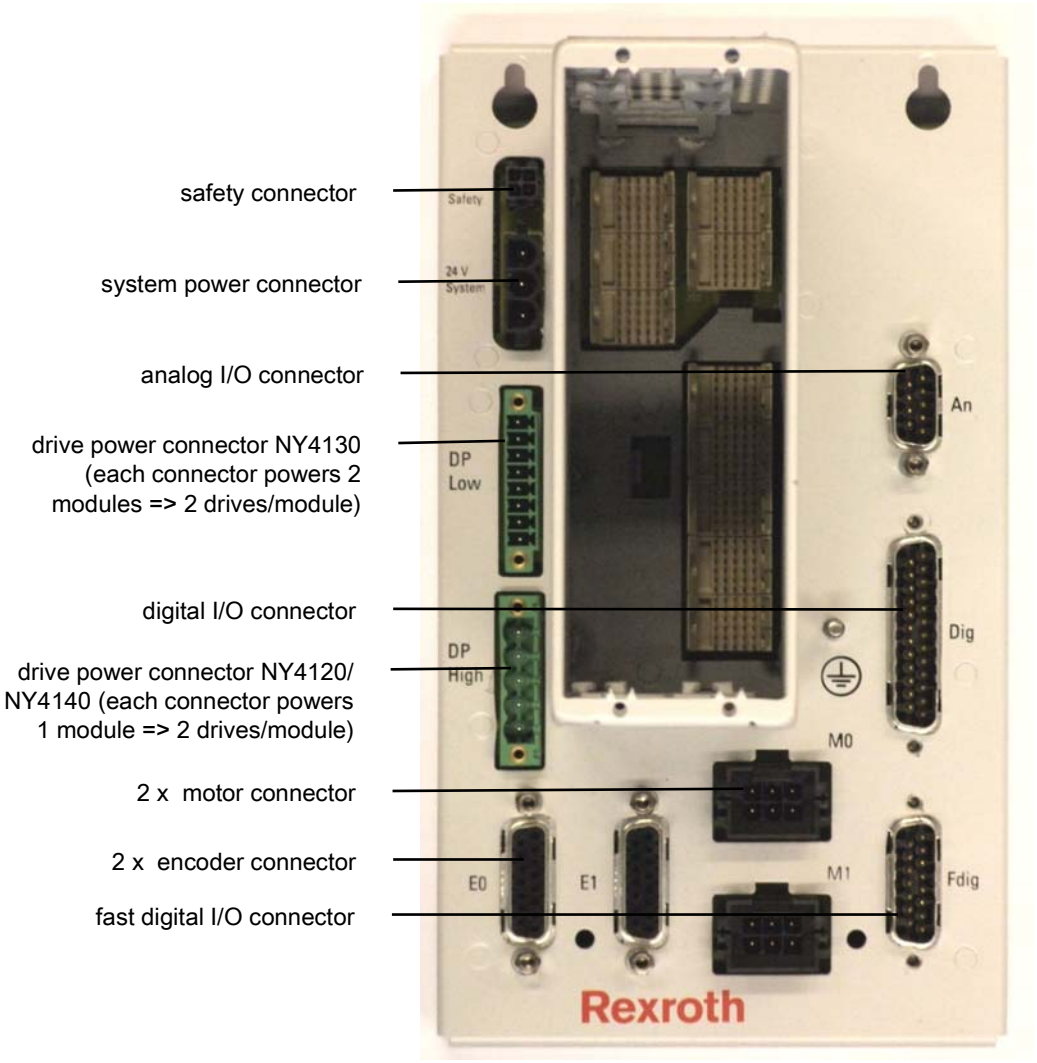


Fig. 89 NY4010 backplane

See section 16 ‘Mechanical Characteristics’ on page 136 for the dimensions of the system.

13.1 Safety Input Connector

Connector type on the backplane: male, four pins Molex micro Mate and Lock connector (Molex, 44914-0402).

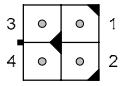


Fig. 90 Safety connector (backplane) pinout

The connector pin assignment is given in Table 69.

Table 69 Pinout Safety connector

Pin	Pin name	Function
1	INP_COMMON	Input common
2	INP_Emergency	Input emergency
3	SHIELD	Cable shield
4	INP_Safety	Input safety

13.2 System Power Connector

The main 24 volt supply connector (24V System) that is used by the MCU module is to generate all the drive module and MCU module supply voltages.

Connector type on the backplane: male, 3 pins Mate and Lock connector (Tyco/AMP, 173925-1).

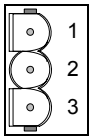


Fig. 91 24V System connector (backplane) pinout

The connector pin assignment is given in Table 70.

Table 70 Pinout 24V System connector

Pin	Pin name	Function
1	SHIELD	Cable shield
2	+24V	System power (24 V DC, 3A)
3	24V_GND	24V common

Both the system power and 24V common are designed to conduct 3 A of current.

13.3 NY4120/4140 Drive Power Connectors

The NY4120/4140 drive power connector is used to connect the drive power supply. For each drive module a separate drive power connector is available. Both the drive power and drive ground are designed to conduct 14 ampere continuous.

Connector type on the backplane: male, Phoenix EMSTBV 2,5/ 5-GF-5,08.

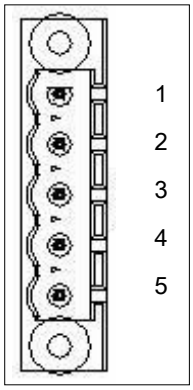


Fig. 92 NY4120/4140 drive power connector (backplane) pinout

The connector pin assignment is given in Table 71.

Table 71 Pinout NY4120/4140 drive power connector

Pin	Pin name	Function
1	DR_PWR+	+ Drive power supply module x
2	DR_PWR+	+ Drive power supply module x
3	Shield	Shield, connected to housing
4	DR_GND	Ground drive power supply module x
5	DR_GND	Ground drive power supply module x

Note:

1. DR_GND must be connected to the same potential as shield (safety ground).
2. The absolute maximum rating of the drive power supply voltage for legacy housings is < 75V.

13.4 NY4130 Drive Power Connectors

The NY4130 drive power connector is used to connect the drive power supply. For each drive module a separate drive power connector is available. Both the drive power + and drive power - are designed to conduct 3 ampere continuous. The drive power ground inherited the 14 ampere net attribute from the NY4120 drive ground.

Connector type on the backplane: male, Phoenix, EMCV 1,5/ 8-GF-3,5.

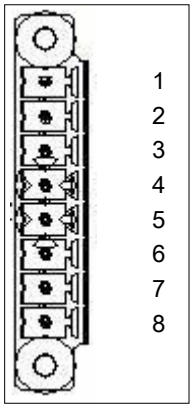


Fig. 93 NY4130 drive power connector (backplane) pinout

The connector pin assignment is given in Table 72.

Table 72 Pinout NY4130 drive power connector

Pin	Pin name	Function
1	DRVPW+L	+ Drive power supply for drive module
2	DRVPW-L	- Drive power supply for drive module
3	DR_GND	Ground Drive power supply for drive module
4	Shield	Shield, connected to housing
5	Shield	Shield, connected to housing
6	-	Not connected
7	-	Not connected
8	-	Not connected

13.5 Motor Connectors

The drive module contains two motor connectors, each connector for one axis.

Connector type on the backplane: male, Molex 6 pins Minifit 43879-0023

Note:

Motor connection to NY4140 differs from motor connection to NY4120 and NY4130.

Table 73 Relation between drive module (Slot) and motor connectors

	Slot-0
Motor connector first axis	M0
Motor connector second axis	M1

The motor connectors are identical in pinout and must have a cable shielding connection. The pins connected to the outputs of the four half bridges must support a continuous current of 7 ampere.

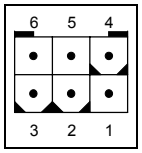


Fig. 94 Motor connector (backplane) pinout

Connection to NY4120 and NY4130

The connector pin assignment for NY4120 and NY4130 is given in Table 74.

Table 74 Pinout motor connectors

Pin	Pin name M0	Pin name M1	BLAC/BLDC motor	DC motor	Stepper motor
1	HB1+	HB3+		+V	A+
2	Shield	Shield			
3	HB2+	HB4+	V		B+
4	HB1-	HB3-	U	-V	A-
5	DR_GND	DR_GND			
6	HB2-	HB4-	W		B-

Brushless motors (BLDC/BLAC)

The connector pin assignment is given in Table 75.

Table 75 Pinout brushless motors (BLDC/BLAC) for NY4120

Pin	Pin name	Function
1	-	Not connected
2	Shield	Shield, connected to housing
3	V	V phase BLDC/BLAC motor
4	U	U phase BLDC/BLAC motor
5	DR_GND	Drive power ground
6	W	W phase BLDC/BLAC motor

Brushed Motors: DC

Table 76 shows the connector pin assignment.

Table 76 Pinout brushed motors: (DC) for NY4120 and NY4130

Pin	Pin name	Function
1	+V	+ DC motor
2	Shield	Shield, connected to housing
3	-	Not connected
4	-V	- DC motor
5	DR_GND	Drive power ground
6	-	Not connected

Stepper Motors

Table 77 shows the connector pin assignment.

Table 77 Pinout stepper motors for NY4120

Pin	Pin name	Function
1	A+	+ Phase 1 stepper motor
2	Shield	Shield, connected to housing
3	B+	+ Phase 2 stepper motor
4	A-	- Phase 1 stepper motor
5	DR_GND	Drive power ground
6	B-	- Phase 2 stepper motor

Connection to NY4140

Because of high voltage constraints, the motor connection on the connectors M0 and M1 when using the NY4140, is different from motor connection on the NY4120/NY4130. Below is the connector pin assignment for the NY4140.

Table 78 Pinout brushless motors (BLDC/BLAC) for NY4140

Pin	Pin name M0	Pin name M1	Function
1	-	-	Not connected
2	Shield	Shield	Shield, connected to housing
3	-	-	Not connected
4	U	W	U phase / W phase BLDC/BLAC motor
5	DR_GND	DR_GND	Drive power ground
6	V	-	V phase BLDC/BLAC motor

Table 79 Pinout brushed motors (DC) for NY4140

Pin	Pin name M0	Pin name M1	Function
1	-	-	Not connected
2	Shield	Shield	Shield, connected to housing
3	-	-	Not connected
4	-	-V	- DC motor
5	DR_GND	DR_GND	Drive power ground
6	+V	-	+ DC motor

13.6 Encoder Connectors

Each motor connector has its own encoder connector (E0 and E1). The encoder connector is of the opposite gender of the fast digital I/O connector to prevent malfunction caused by mismatching.

Connector type on the backplane: female, 15 pins sub-D

Table 80 Relation between drive module (Slot) and encoder connectors

	Slot-0
Encoder connector for first axis	E0
Encoder connector for second axis	E1

The connector pin assignment is given in Table 81.

Table 81 Pinout encoder connectors

Pin	Pin name	Function
1	Enc5V	5 Volt supply of encoder (max 300 mA)
2	EncVref	2.05 Volt
3	EncS0+	S00 / A differential input +
4	EncS90+	S90 / B differential input +
5	EncIndex+	Index differential input / non-differential input
6	Dig5VInA+	Hall A differential input + or 5V TTL input
7	Dig5VInB+	Hall B differential input + or 5V TTL input
8	Dig5VInC+	Hall C differential input + or 5V TTL input
9	EncGND	Ground for power supply for encoder
10	EncS0-	S00 / A differential input -
11	EncS90-	S90 / B differential input -
12	EncIndex-	Index differential input -
13	Dig5VInA-	Hall A differential input - or 5V TTL input
14	Dig5VInB-	Hall B differential input - or 5V TTL input
15	Dig5VInC-	Hall C differential input - or 5V TTL input
Housing	Housing Shield	Shield of cable

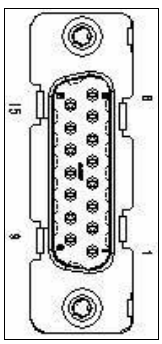


Fig. 95 Encoder connector (backplane) pinout

13.7 Fast Digital I/O Connectors

The fast digital I/O connector (Fdig) is available for the drive module.

Connector type on the backplane: male, 15 pins sub-D

The connector pin assignment is given in Table 82.

Table 82 Pinout fast digital I/O connectors

Pin	Pin name	Function
1	24V_DIO	24 Volt supply for all digital outputs
2	FastIn0	Fast Input 0
3	FastIn1	Fast Input 1
4	FastOut0	Fast Output 0
5	FastOut1	Fast Output 1
6	Opt_0+	Not applicable
7	Opt_1+	Not applicable
8	Opt_2+	Not applicable
9	24V_DIO	24 Volt supply for all digital outputs
10	GND_DIO	Ground for digital input or output
11	GND_DIO	Ground for digital input or output
12	DGND	Ground for NY4199 option connector
13	Opt_0-	Not applicable
14	Opt_1-	Not applicable
15	Opt_2-	Not applicable
Housing	Housing Shield	Shield of cable

Note:

Be careful not to connect DGND to GND_DIO, otherwise malfunctioning of the module could occur.

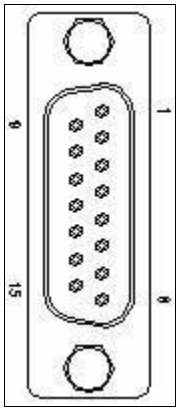


Fig. 96 Fast digital I/O connector (backplane) pinout

13.8 Digital I/O Connectors

The digital I/O connector (Dig) is available for the drive module.
Connector type on the backplane: male, 25 pins sub-D

Table 83 Pinout digital I/O connectors

Pin	Pin name	Function
1	DigIn0	Digital Input in group 0
2	DigIn1	Digital Input in group 0
3	DigIn2	Digital Input in group 0
4	DigIn3	Digital Input in group 0
5	DigIn4	Digital Input in group 1
6	DigIn5	Digital Input in group 1
7	DigIn6	- Digital Input in group 1, - Stop alarm input for axis 0 in group 1 (only supported NY4120 and NY4140)
8	DigIn7	- Digital Input in group 1, - Stop alarm input for axis 1 in group 1 (only supported NY4120)
9	GND_DIO	Ground for digital Output, connected to power supply
10	DigOut0	Digital Output
11	DigOut1	Digital Output
12	DigOut2	Digital Output
13	DigOut3	Digital Output
14	DigComm0	Common for digital Input group 0, may be ground or 24V
15	DigIn8	Digital Input in group 2 (only supported NY4130)
16	DigIn9	Digital Input in group 2 (only supported NY4130)
17	DigIn10	Stop alarm input for axis 0 in group 2 (only supported NY4130)
18	DigIn11	Stop alarm input for axis 1 in group 2 (only supported NY4130)
19	DigComm2	Common for digital Input group 2, may be ground or 24V
20	DigComm1	Common for digital Input group 1, may be ground or 24V
21	GND_DIO	Ground for digital Output, connected to power supply
22	24V_DIO	24 V digital Output supply
23	24V_DIO	24 V digital Output supply
24	24V_DIO	24 V digital Output supply
25	24V_DIO	24 V digital Output supply
Housing	Shield	Shield of cable

Legacy NY4010: 1 Drive Slot System Housing

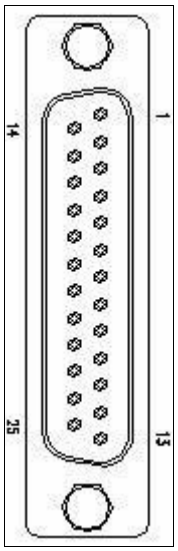


Fig. 97 Digital I/O connector (backplane) pinout

13.9 Analog I/O Connector

For the drive module an analog I/O connector is available.

Connector type on the backplane: male, 9 pins sub-D

Table 84 Pinout analog I/O connector

Pin	Pin name	Function
1	AnIn0+	Positive analog input +/- 10 V (differential or single ended)
2	AnIn0C	NY4120/4140: Positive analog input 4-20 mA must be linked in connector to AnIn0+ NY4130: analog reference output voltage
3	AnIn0-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)
4	AnOut0+	Analog output
5	AnOut1+	Analog output
6	AnIn1+	Positive analog input +/- 10 V (differential or single ended)
7	AnIn1C	NY4120/4140: Positive analog input 4-20 mA must be linked in connector to AnIn1+ NY4130: analog reference output voltage
8	AnGND	Return for analog output or 4-20 mA input, ground reference for inputs
9	AnIn1-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)
Housing	Shield	Shield of cable

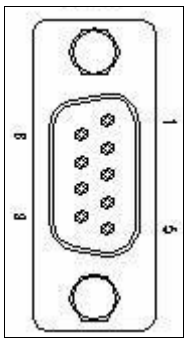


Fig. 98 Analog I/O connector (backplane) pinout

14 Legacy NY4040: 4 Drive Slot System Housing

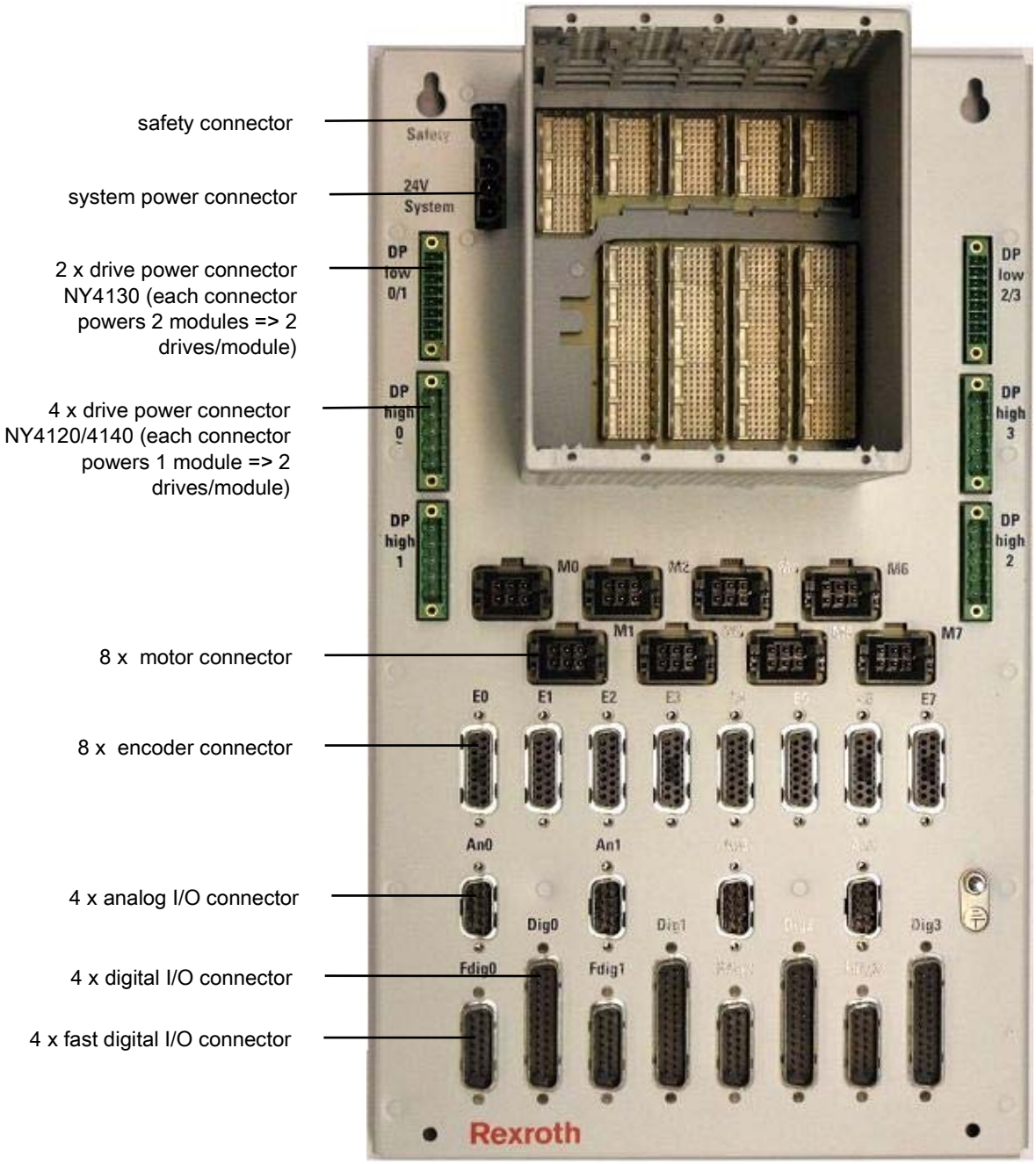


Fig. 99 NY4040 backplane

See section 16 ‘Mechanical Characteristics’ on page 136 for the dimensions of the system.

Note:
Slot 0, the first drive slot next to the MCU, must be occupied with a drive module (NY4120, NY4130, NY4140), or the NY4150.

14.1 Safety Input Connector

Connector type on the backplane: male, four pins Molex micro Mate and Lock connector (Molex, 44914-0402).

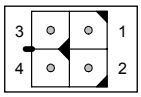


Fig. 100 Safety connector (backplane) pinout

The connector pin assignment is given in Table 85.

Table 85 Pinout Safety connector

Pin	Pin name	Function
1	INP_COMMON	Input common
2	INP_Emergency	Input emergency
3	SHIELD	Cable shield
4	INP_Safety	Input safety

14.2 System Power Connector

The main 24 volt supply connector (24V System) that is used by the MCU module is to generate all the drive module and MCU module supply voltages.

Connector type on the backplane: male, 3 pins Mate and Lock connector (Tyco/AMP, 173925-1).

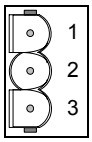


Fig. 101 24V System connector (backplane) pinout

The connector pin assignment is given in Table 86.

Table 86 Pinout 24V System connector

Pin	Pin name	Function
1	SHIELD	Cable shield
2	+24V	System power (24 V DC, 3A)
3	24V_GND	24V common

Both the system power and 24V common are designed to conduct 3 A of current.

14.3 NY4120/4140 Drive Power Connectors

The NY4120/4140 drive power connector is used to connect the drive power supply. For each drive module a separate drive power connector is available. Both the drive power and drive ground are designed to conduct 14 ampere continuous.

Connector type on the backplane: male, Phoenix, EMSTBV 2,5/ 5-GF-5,08.

The following NY4120/4140 drive power connectors are available at the backplane:

- DPhigh0: drive power for drive module 0
- DPhigh1: drive power for drive module 1
- DPhigh2: drive power for drive module 2
- DPhigh3: drive power for drive module 3

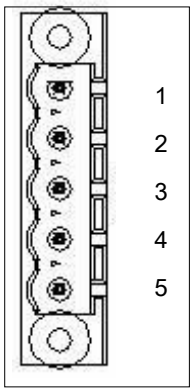


Fig. 102 NY4120/4140 drive power connector (backplane) pinout

The connector pin assignment is given in Table 87.

Table 87 Pinout NY4120/4140 drive power connector

Pin	Pin name	Function
1	DR_PWR+	+ Drive power supply module x
2	DR_PWR+	+ Drive power supply module x
3	Shield	Shield, connected to housing
4	DR_GND	Ground drive power supply module x
5	DR_GND	Ground drive power supply module x

Note:

1. DR_GND must be connected to the same potential as shield (safety ground).
2. The absolute maximum rating of the drive power voltage for legacy housings is < 75V.

14.4 NY4130 Drive Power Connectors

The NY4130 drive power connector is used to connect the drive power supply. Both the drive power + and drive power - are designed to conduct 3 ampere continuous. The drive power ground inherited the 14 ampere net attribute from the NY4120 drive ground.

Connector type on the backplane: male, Phoenix, EMCV 1.5/ 8-GF-3,5.

The following drive power connectors are available at the backplane:

- DPlow0/1: drive power for drive modules 0 and 1
- DPlow2/3: drive power for drive modules 2 and 3

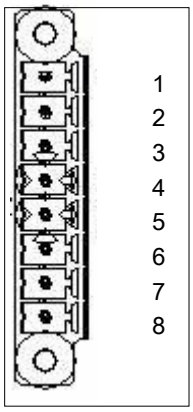


Fig. 103 NY4130 drive power connector (backplane) pinout

The connector pin assignment is given in Table 88.

Table 88 Pinout NY4130 drive power connector

Pin	Pin name	Function
1	DRVPW+L0	+ Drive power supply for drive module 0 or 2
2	DRVPW-L0	- Drive power supply for drive module 0 or 2
3	DR_GND	Ground Drive power supply for drive module 0 or 2
4	Shield	Shield, connected to housing
5	Shield	Shield, connected to housing
6	DR_GND	Ground Drive power supply for drive module 1 or 3
7	DRVPW-L1	- Drive power supply module for drive module 1 or 3
8	DRVPW+L1	+ Drive power supply module for drive module 1 or 3

14.5 Motor Connectors

Each drive module contains two motor connectors, each connector for one axis.

Connector type on the backplane: male, Molex 6 pins Minifit 43879-0023

Note:
Motor connection to NY4140 differs from motor connection to NY4120 and NY4130.

Table 89 Relation between drive modules (Slot) and motor connectors

	Slot-0	Slot-1	Slot-2	Slot-3
Motor connector first axis	M0	M2	M4	M6
Motor connector second axis	M1	M3	M5	M7

The motor connectors are identical in pinout and must have a cable shielding connection. The pins connected to the outputs of the four half bridges must support a continuous current of 7 ampere.

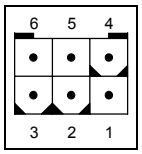


Fig. 104 Motor connector (backplane) pinout

Connection to NY4120 and NY4130

The connector pin assignment for NY4120 and NY4130 is given in Table 90.

Table 90 Pinout motor connectors

Pin	Pin name M0, M2, M4, M6	Pin name M1, M3, M5, M7	BLDC/BLAC motor	DC motor	Stepper motor
1	HB1+	HB3+		+V	A+
2	Shield	Shield			
3	HB2+	HB4+	V		B+
4	HB1-	HB3-	U	-V	A-
5	DR_GND	DR_GND			
6	HB2-	HB4-	W		B-

Brushless motors (BLDC/BLAC)

The connector pin assignment is given in Table 91.

Table 91 Pinout brushless motors (BLDC/BLAC) for NY4120

Pin	Pin name	Function
1	-	Not connected
2	Shield	Shield, connected to housing
3	V	V phase BLDC/BLAC motor
4	U	U phase BLDC/BLAC motor
5	DR_GND	Drive power ground
6	W	W phase BLDC/BLAC motor

Brushed Motors: DC

Table 92 shows the connector pin assignment.

Table 92 Pinout brushed motors: (DC) for NY4120 and NY4130

Pin	Pin name	Function
1	+V	+ DC motor
2	Shield	Shield, connected to housing
3	-	Not connected
4	-V	- DC motor
5	DR_GND	Drive power ground
6	-	Not connected

Stepper Motors

Table 93 shows the connector pin assignment.

Table 93 Pinout stepper motors for NY4120

Pin	Pin name	Function
1	A+	+ Phase 1 stepper motor
2	Shield	Shield, connected to housing
3	B+	+ Phase 2 stepper motor
4	A-	- Phase 1 stepper motor
5	DR_GND	Drive power ground
6	B-	- Phase 2 stepper motor

Connection to NY4140

Because of high voltage constraints, the motor connection on the connectors M0 and M1 when using the NY4140, is different from motor connection on the NY4120/NY4130. Below is the connector pin assignment for the NY4140.

Table 94 Pinout brushless motors (BLDC/BLAC) for NY4140

Pin	Pin name M0	Pin name M1	Function
1	-	-	Not connected
2	Shield	Shield	Shield, connected to housing
3	-	-	Not connected
4	U	W	U phase / W phase BLDC/BLAC motor
5	DR_GND	DR_GND	Drive power ground
6	V	-	V phase BLDC/BLAC motor

Table 95 Pinout brushed motors (DC) for NY4140

Pin	Pin name M0	Pin name M1	Function
1	-	-	Not connected
2	Shield	Shield	Shield, connected to housing
3	-	-	Not connected
4	-	-V	- DC motor
5	DR_GND	DR_GND	Drive power ground
6	+V	-	+ DC motor

14.6 Encoder Connectors

Each motor connector has its own encoder connector (E1 – E7). The encoder connector is of the opposite gender of the fast digital I/O connector to prevent malfunction caused by mismatching.

Connector type on the backplane: female, 15 pins sub-D

Table 96 Relation between drive modules (Slot) and encoder connectors

	Slot-0	Slot-1	Slot-2	Slot-3
Encoder connector for first axis	E0	E2	E4	E6
Encoder connector for second axis	E1	E3	E5	E7

The connector pin assignment is given in Table 97.

Table 97 Pinout encoder connectors

Pin	Pin name	Function
1	Enc5V	5 V supply of encoder (max 300 mA)
2	EncVref	2.5 V
3	EncS0+	S00 / A differential input +
4	EncS90+	S90 / B differential input +
5	EncIndex+	Index differential input / non-differential input
6	Dig5VInA+	Hall A differential input + or 5 V TTL input
7	Dig5VInB+	Hall B differential input + or 5 V TTL input
8	Dig5VInC+	Hall C differential input + or 5 V TTL input
9	EncGND	Ground for power supply for encoder
10	EncS0-	S00 / A differential input -
11	EncS90-	S90 / B differential input -
12	EncIndex-	Index differential input -
13	Dig5VInA-	Hall A differential input - or 5 V TTL input
14	Dig5VInB-	Hall B differential input - or 5 V TTL input
15	Dig5VInC-	Hall C differential input - or 5 V TTL input
Housing	Housing Shield	Shield of cable

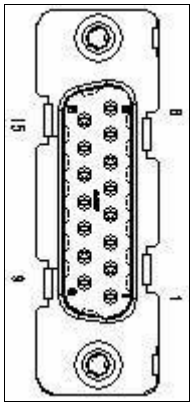


Fig. 105 Encoder connector (backplane) pinout

14.7 Fast Digital I/O Connectors

The fast digital I/O connector (Fdigx) is available for each drive module. The following connectors are fast digital I/O Connectors: Fdig0, Fdig1, Fdig2, Fdig3.

Connection type on the backplane: male, 15 pins sub-D

The connector pin assignment is given in Table 98.

Table 98 Pinout fast digital I/O connectors

Pin	Pin name	Function
1	24V_DIO	24 V supply for all digital outputs
2	FastIn0	Fast Input 0
3	FastIn1	Fast Input 1
4	FastOut0	Fast Output 0
5	FastOut1	Fast Output 1
6	Opt_0+	Not applicable
7	Opt_1+	Not applicable
8	Opt_2+	Not applicable
9	24V_DIO	24 V supply for all digital outputs
10	GND_DIO	Ground for digital input or output
11	GND_DIO	Ground for digital input or output
12	DGND	Ground for NY4199 option connector
13	Opt_0-	Not applicable
14	Opt_1-	Not applicable
15	Opt_2-	Not applicable
Housing	Housing Shield	Shield of cable

Note:
Be careful not tot connect DGND to GND_DIO, otherwise malfunctioning of the module could occur.

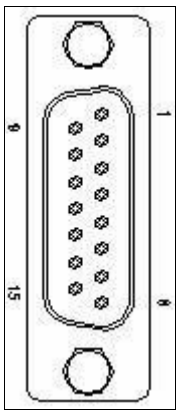


Fig. 106 Fast digital I/O connector (backplane) pinout

14.8 Digital I/O Connectors

The digital I/O connector (Digx) is available for each drive module. The following connectors are digital I/O connector: Dig0, Dig1, Dig2, Dig3.

Connector type on the backplane: male, 25 pins sub-D

Table 99 Pinout digital I/O connectors

Pin	Pin name	Function
1	DigIn0	Digital Input in group 0
2	DigIn1	Digital Input in group 0
3	DigIn2	Digital Input in group 0
4	DigIn3	Digital Input in group 0
5	DigIn4	Digital Input in group 1
6	DigIn5	Digital Input in group 1
7	DigIn6	- Digital Input in group 1, - Stop alarm input for axis 0 in group 1 (only supported NY4120 and NY4140)
8	DigIn7	- Digital Input in group 1, - Stop alarm input for axis 1 in group 1 (only supported NY4120)
9	GND_DIO	Ground for digital Output, connected to power supply
10	DigOut0	Digital Output
11	DigOut1	Digital Output
12	DigOut2	Digital Output
13	DigOut3	Digital Output
14	DigComm0	Common for digital Input group 0, may be ground or 24 V
15	DigIn8	Digital Input in group 2 (only supported NY4130)
16	DigIn9	Digital Input in group 2 (only supported NY4130)
17	DigIn10	Stop alarm input for axis 0 in group 2 (only supported NY4130)
18	DigIn11	Stop alarm input for axis 1 in group 2 (only supported NY4130)
19	DigComm2	Common for digital Input group 2, may be ground or 24 V
20	DigComm1	Common for digital Input group 1, may be ground or 24V
21	GND_DIO	Ground for digital Output, connected to power supply
22	24V_DIO	24 V digital Output supply
23	24V_DIO	24 V digital Output supply
24	24V_DIO	24 V digital Output supply
25	24V_DIO	24 V digital Output supply
Housing	Shield	Shield of cable

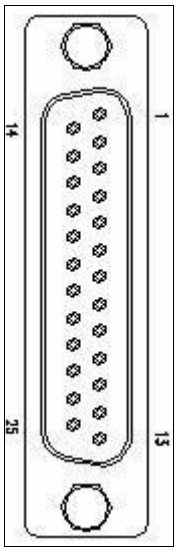


Fig. 107 Digital I/O connector (backplane) pinout

14.9 Analog I/O Connector

For each drive module a analog I/O connector is available.

Connector type on the backplane: male, 9 pins sub-D

Table 100 Pinout analog I/O connector first axis motor, An0, An1, An2, An3

Pin	Pin name	Function
1	AnIn0+	Positive analog input +/- 10 V (differential or single ended)
2	AnIn0C	NY4120/4140: Positive analog input 4-20 mA must be linked in connector to AnIn0+ NY4130: analog reference output voltage
3	AnIn0-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)
4	AnOut0+	Analog output
5	AnOut1+	Analog output
6	AnIn1+	Positive analog input +/- 10 V (differential or single ended)
7	AnIn1C	NY4120/4140: Positive analog input 4-20 mA must be linked in connector to AnIn1+ NY4130: analog reference output voltage
8	AnGND	Return for analog output or 4-20 mA input, ground reference for inputs
9	AnIn1-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)
Housing	Shield	Shield of cable

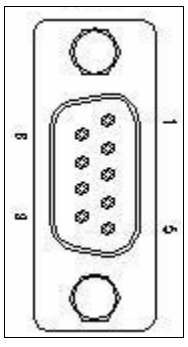


Fig. 108 Analog I/O connector (backplane) pinout

15 Legacy NY4050: 5 Drive Slot System Housing

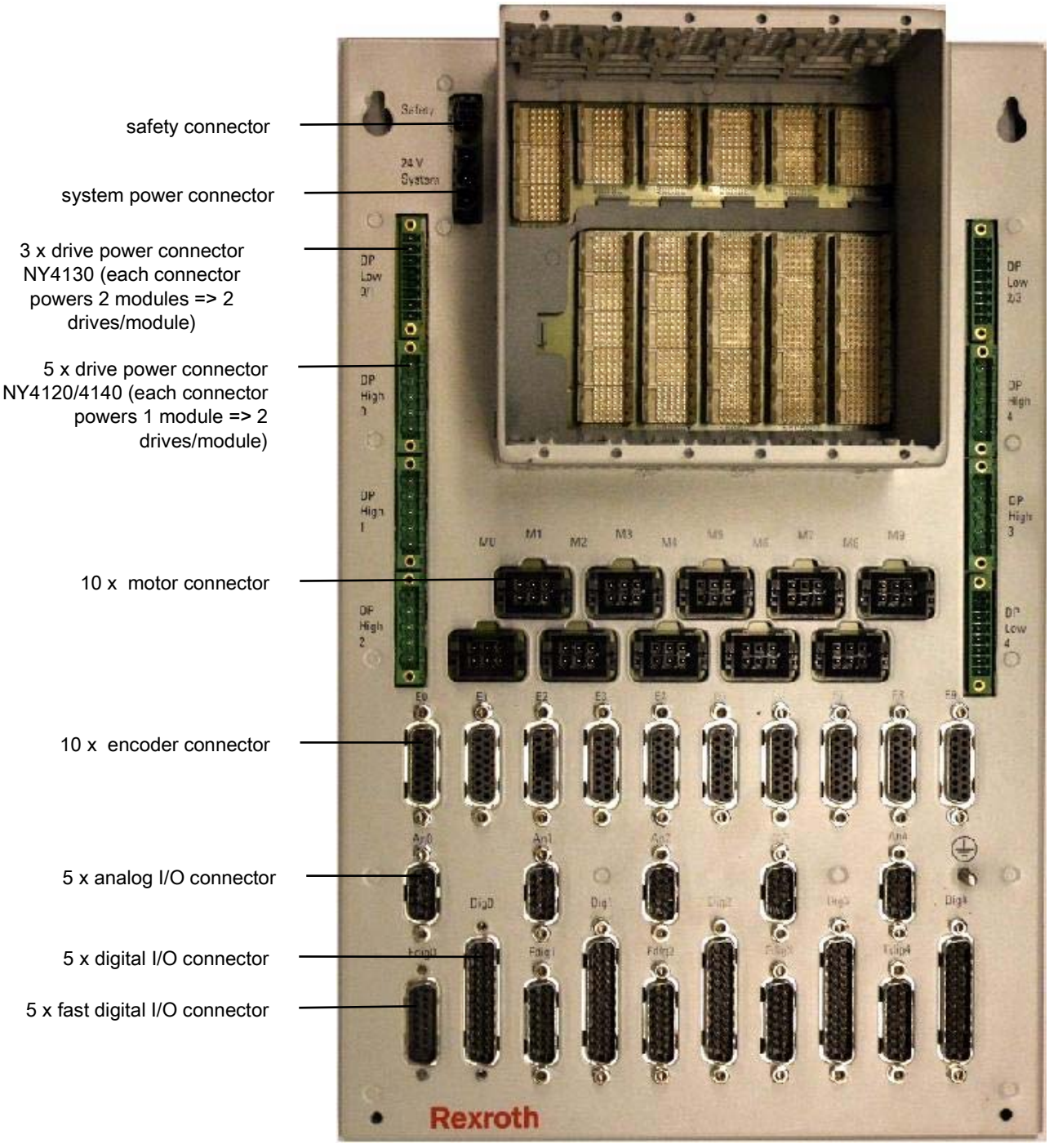


Fig. 109 NY4050 backplane

See section 16 ‘Mechanical Characteristics’ on page 136 for the dimensions of the system.

Note:
Slot 0, the first drive slot next to the MCU, must be occupied with a drive module (NY4120, NY4130, NY4140), or the NY4150.

15.1 Safety Input Connector

Connector type on the backplane: male, four pins Molex micro Mate and Lock connector (Molex, 44914-0402).

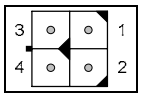


Fig. 110 Safety connector (backplane) pinout

The connector pin assignment is given in Table 101.

Table 101 Pinout Safety connector

Pin	Pin name	Function
1	INP_COMMON	Input common
2	INP_Emergency	Input emergency
3	SHIELD	Cable shield
4	INP_Safety	Input safety

15.2 System Power Connector

The main 24 volt supply connector (24V System) that is used by the MCU module is to generate all the drive module and MCU module supply voltages.

Connector type on the backplane: male, 3 pins Mate and Lock connector (Tyco/AMP, 173925-1).

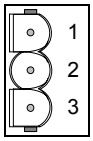


Fig. 111 24V System connector (backplane) pinout

The connector pin assignment is given in Table 102.

Table 102 Pinout 24V System connector

Pin	Pin name	Function
1	SHIELD	Cable shield
2	+24V	System power (24 V DC, 3A)
3	24V_GND	24V common

Both the system power and 24V common are designed to conduct 3 A of current.

15.3 NY4120/4140 Drive Power Connectors

The NY4120/4140 drive power connector is used to connect the drive power supply. For each drive module a separate drive power connector is available. Both the drive power and drive ground are designed to conduct 14 ampere continuous.

The following NY4120/4140 drive power connectors are available at the backplane:

- DPhigh0: drive power for drive module 0
- DPhigh1: drive power for drive module 1
- DPhigh2: drive power for drive module 2
- DPhigh3: drive power for drive module 3
- DPhigh4: drive power for drive module 4

Connector type on the backplane: male, Phoenix, EMSTBV 2,5/ 5-GF-5,08.

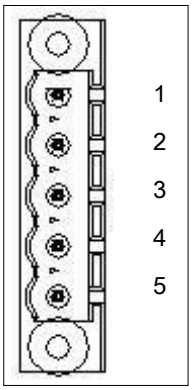


Fig. 112 NY4120/4140 drive power connector (backplane) pinout

The connector pin assignment is given in Table 103.

Table 103 Pinout NY4120/4140 drive power connector

Pin	Pin name	Function
1	DR_PWR+	+ Drive power supply module x
2	DR_PWR+	+ Drive power supply module x
3	Shield	Shield, connected to housing
4	DR_GND	Ground drive power supply module x
5	DR_GND	Ground drive power supply module x

Note:

1. DR_GND must be connected to the same potential as shield (safety ground).
2. The absolute maximum rating of the drive power voltage for legacy housings is < 75V.

15.4 NY4130 Drive Power Connectors

The NY4130 drive power connector is used to connect the drive power supply. For each drive module a separate drive power connector is available. Both the drive power + and drive power - are designed to conduct 3 ampere continuous. The drive power ground inherited the 14 ampere net attribute from the NY4120 drive ground.

The following drive power connectors are available at the backplane:

- DPlow0/1: drive power for drive modules 0 and 1
- DPlow2/3: drive power for drive modules 2 and 3
- DPlow4: drive power for drive module 4

Connector type on the backplane: male, Phoenix, EMCV 1,5/ 8-GF-3,5.

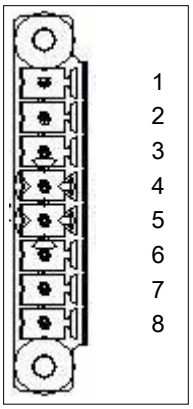


Fig. 113 NY4130 drive power connector (backplane) pinout

The connector pin assignment is given in Table 104.

Table 104 Pinout NY4130 drive power connector

Pin	Pin name	Function
1	DRVPW+L0	+ Drive power supply for drive modules 0, 2 or 4
2	DRVPW-L0	- Drive power supply for drive modules 0, 2 or 4
3	DR_GND	Ground Drive power supply drive modules 0, 2 or 4
4	Shield	Shield, connected to housing
5	Shield	Shield, connected to housing
6	DR_GND	Ground Drive power supply for drive modules 1 or 3
7	DRVPW-L1	- Drive power supply module for drive modules 1 or 3
8	DRVPW+L1	+ Drive power supply module for drive modules 1 or 3

15.5 Motor Connectors

Each drive module contains two motor connectors, each connector for one axis.

Connector type on the backplane: male, Molex 6 pins Minifit 43879-0023

Note:

Motor connection to NY4140 differs from motor connection to NY4120 and NY4130.

Table 105 Relation between drive modules (Slot) and motor connectors

	Slot-0	Slot-1	Slot-2	Slot-3	Slot-4
Motor connector first axis	M0	M2	M4	M6	M8
Motor connector second axis	M1	M3	M5	M7	M9

The motor connectors are identical in pinout and must have a cable shielding connection. The pins connected to the outputs of the four half bridges must support a continuous current of 7 ampere.

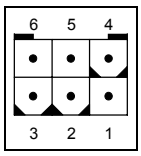


Fig. 114 Motor connector (backplane) pinout

The connector pin assignment is given in Table 106.

Table 106 Pinout motor connectors

Pin	Pin name M0, M2, M4, M6, M8	Pin name M1, M3, M5, M7, M9	BLDC/BLAC motor	DC motor	Stepper motor
1	HB1+	HB3+		+V	A+
2	Shield	Shield			
3	HB2+	HB4+	V		B+
4	HB1-	HB3-	U	-V	A-
5	DR_GND	DR_GND			
6	HB2-	HB4-	W		B-

Connection to NY4120 and NY4130

Brushless motors (BLDC/BLAC)

The connector pin assignment is given in the Table 107.

Table 107 Pinout brushless motors (BLDC/BLAC) for NY4120

Pin	Pin name	Function
1	-	Not connected
2	Shield	Shield, connected to housing
3	V	V phase BLDC/BLAC motor
4	U	U phase BLDC/BLAC motor
5	DR_GND	Drive power ground
6	W	W phase BLDC/BLAC motor

Brushed Motors: DC

Table 108 shows the connector pin assignment.

Table 108 Pinout brushed motors: (DC) for NY4120 and NY4130

Pin	Pin name	Function
1	+V	+ DC motor
2	Shield	Shield, connected to housing
3	-	Not connected
4	-V	- DC motor
5	DR_GND	Drive power ground
6	-	Not connected

Stepper Motors

Table 109 shows the connector pin assignment.

Table 109 Pinout stepper motors for NY4120

Pin	Pin name	Function
1	A+	+ Phase 1 stepper motor
2	Shield	Shield, connected to housing
3	B+	+ Phase 2 stepper motor
4	A-	- Phase 1 stepper motor
5	DR_GND	Drive power ground
6	B-	- Phase 2 stepper motor

Connection to NY4140

Because of high voltage constraints, the motor connection on the connectors M0 and M1 when using the NY4140, is different from motor connection on the NY4120/NY4130. Below is the connector pin assignment for the NY4140.

Table 110 Pinout brushless motors (BLDC/BLAC) for NY4140

Pin	Pin name M0	Pin name M1	Function
1	-	-	Not connected
2	Shield	Shield	Shield, connected to housing
3	-	-	Not connected
4	U	W	U phase / W phase BLDC/BLAC motor
5	DR_GND	DR_GND	Drive power ground
6	V	-	V phase BLDC/BLAC motor

Table 111 Pinout brushed motors (DC) for NY4140

Pin	Pin name M0	Pin name M1	Function
1	-	-	Not connected
2	Shield	Shield	Shield, connected to housing
3	-	-	Not connected
4	-	-V	- DC motor
5	DR_GND	DR_GND	Drive power ground
6	+V	-	+ DC motor

15.6 Encoder Connectors

Each motor connector has its own encoder connector (E0 – E9). The encoder connector is of the opposite gender of the fast digital I/O connector to prevent malfunction caused by mismatching.

Connector type on the backplane: female, 15 pins sub-D

Table 112 Relation between drive modules (Slot) and encoder connectors

	Slot-0	Slot-1	Slot-2	Slot-3	Slot-4
Encoder connector for first axis	E0	E2	E4	E6	E8
Encoder connector for second axis	E1	E3	E5	E7	E9

The connector pin assignment is given in Table 113.

Table 113 Pinout encoder connectors

Pin	Pin name	Function
1	Enc5V	5 V supply of encoder (max 300 mA)
2	EncVref	2.5 V
3	EncS0+	S00 / A differential input +
4	EncS90+	S90 / B differential input +
5	EncIndex+	Index differential input / non-differential input
6	Dig5VInA+	Hall A differential input + or 5 V TTL input
7	Dig5VInB+	Hall B differential input + or 5 V TTL input
8	Dig5VInC+	Hall C differential input + or 5 V TTL input
9	EncGND	Ground for power supply for encoder
10	EncS0-	S00 / A differential input -
11	EncS90-	S90 / B differential input -
12	EncIndex-	Index differential input -
13	Dig5VInA-	Hall A differential input - or 5 V TTL input
14	Dig5VInB-	Hall B differential input - or 5 V TTL input
15	Dig5VInC-	Hall C differential input - or 5 V TTL input
Housing	Housing Shield	Shield of cable

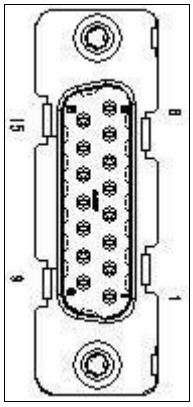


Fig. 115 Encoder connector (backplane) pinout

15.7 Fast Digital I/O Connectors

The fast digital I/O connector (Fdigx) is available for each drive module. The following connectors are fast digital I/O Connectors: Fdig0, Fdig1, Fdig2, Fdig3, Fdig4.

Connector type on the backplane: male, 15 pins sub-D

The connector pin assignment is given in Table 114.

Table 114 Pinout fast digital I/O connectors

Pin	Pin name	Function
1	24V_DIO	24 V supply for all digital outputs
2	FastIn0	Fast Input 0
3	FastIn1	Fast Input 1
4	FastOut0	Fast Output 0
5	FastOut1	Fast Output 1
6	Opt_0+	Not applicable
7	Opt_1+	Not applicable
8	Opt_2+	Not applicable
9	24V_DIO	24 V supply for all digital outputs
10	GND_DIO	Ground for digital input or output
11	GND_DIO	Ground for digital input or output
12	DGND	Ground for NY4199 option connector
13	Opt_0-	Not applicable
14	Opt_1-	Not applicable
15	Opt_2-	Not applicable
Housing	Housing Shield	Shield of cable

Note:

Be careful not tot connect DGND to GND_DIO, otherwise malfunctioning of the module could occur.

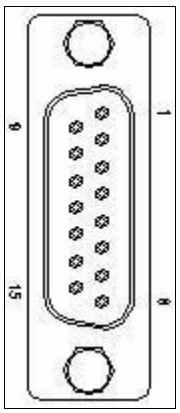


Fig. 116 Fast digital I/O connector (backplane) pinout

15.8 Digital I/O Connectors

The digital I/O connector (Digx) is available for each drive module. The following connectors are digital I/O connector: Dig0, Dig1, Dig2, Dig3, Dig4.

Connector type on the backplane: male, 25 pins sub-D

Table 115 Pinout digital I/O connectors

Pin	Pin name	Function
1	DigIn0	Digital Input in group 0
2	DigIn1	Digital Input in group 0
3	DigIn2	Digital Input in group 0
4	DigIn3	Digital Input in group 0
5	DigIn4	Digital Input in group 1
6	DigIn5	Digital Input in group 1
7	DigIn6	- Digital Input in group 1, - Stop alarm input for axis 0 in group 1 (only supported NY4120 and NY4140)
8	DigIn7	- Digital Input in group 1, - Stop alarm input for axis 1 in group 1 (only supported NY4120)
9	GND_DIO	Ground for digital Output, connected to power supply
10	DigOut0	Digital Output
11	DigOut1	Digital Output
12	DigOut2	Digital Output
13	DigOut3	Digital Output
14	DigComm0	Common for digital Input group 0, may be ground or 24 V
15	DigIn8	Digital Input in group 2 (only supported NY4130)
16	DigIn9	Digital Input in group 2 (only supported NY4130)
17	DigIn10	Stop alarm input for axis 0 in group 2 (only supported NY4130)
18	DigIn11	Stop alarm input for axis 1 in group 2 (only supported NY4130)
19	DigComm2	Common for digital Input group 2, may be ground or 24 V
20	DigComm1	Common for digital Input group 1, may be ground or 24 V
21	GND_DIO	Ground for digital Output, connected to power supply
22	24V_DIO	24 V digital Output supply
23	24V_DIO	24 V digital Output supply
24	24V_DIO	24 V digital Output supply
25	24V_DIO	24 V digital Output supply
Housing	Shield	Shield of cable

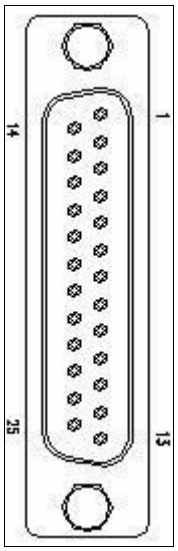


Fig. 117 Digital I/O connector (backplane) pinout

15.9 Analog I/O Connector

For each drive module an analog I/O connector is available.

Connector type on the backplane: male, 9 pins sub-D

Table 116 Pinout analog I/O connector first axis motor, An1, An2, An3, An4

Pin	Pin name	Function
1	AnIn0+	Positive analog input +/- 10 V (differential or single ended)
2	AnIn0C	NY4120/4140: Positive analog input 4-20 mA must be linked in connector to AnIn0+ NY4130: analog reference output voltage
3	AnIn0-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)
4	AnOut0+	Analog output
5	AnOut1+	Analog output
6	AnIn1+	Positive analog input +/- 10 V (differential or single ended)
7	AnIn1C	NY4120/4140: Positive analog input 4-20 mA must be linked in connector to AnIn1+ NY4130: analog reference output voltage
8	AnGND	Return for analog output or 4-20 mA input, ground reference for inputs
9	AnIn1-	• Negative analog input +/- 10 V (differential input) or connected to AnGND in case of single ended input. • Negative analog input 4-20 mA must be linked in connector to AnGND (Only NY4120/NY4140)
Housing	Shield	Shield of cable

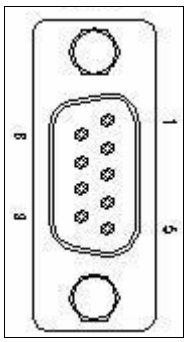


Fig. 118 Analog I/O connector (backplane) pinout

16 Mechanical Characteristics

16.1 Module Size

NYCe4000 control system is designed in a very small size. The module size is 130 mm depth and 115 mm height. The distance between the modules is 20 mm.

The connections to the IEEE 1394 network are located on the front of the NY4110 and NY4111. Make sure that your machine design has sufficient free clearance space in front of the NY4110 or NY4111 for the NY4901 bracket and the maximum allowed bending of the FireWire and Cat-5e or Cat-6 cables. As rule of thumb, 100 mm should suffice.

If your machine design uses the NY4130, make sure that your machine design has at least 35 mm free clearance space in front of the NY4130 for the heatsink.

16.2 System dimensions

- NY4012 - 1 Drive Slot System Housing
- NY4022 - 2 Drive Slot System Housing
- NY4042 - 4 Drive Slot System Housing
- NY4052 - 5 Drive Slot System Housing
- NY4072 - 2 Drive Slot System Housing for LMS

NY4012

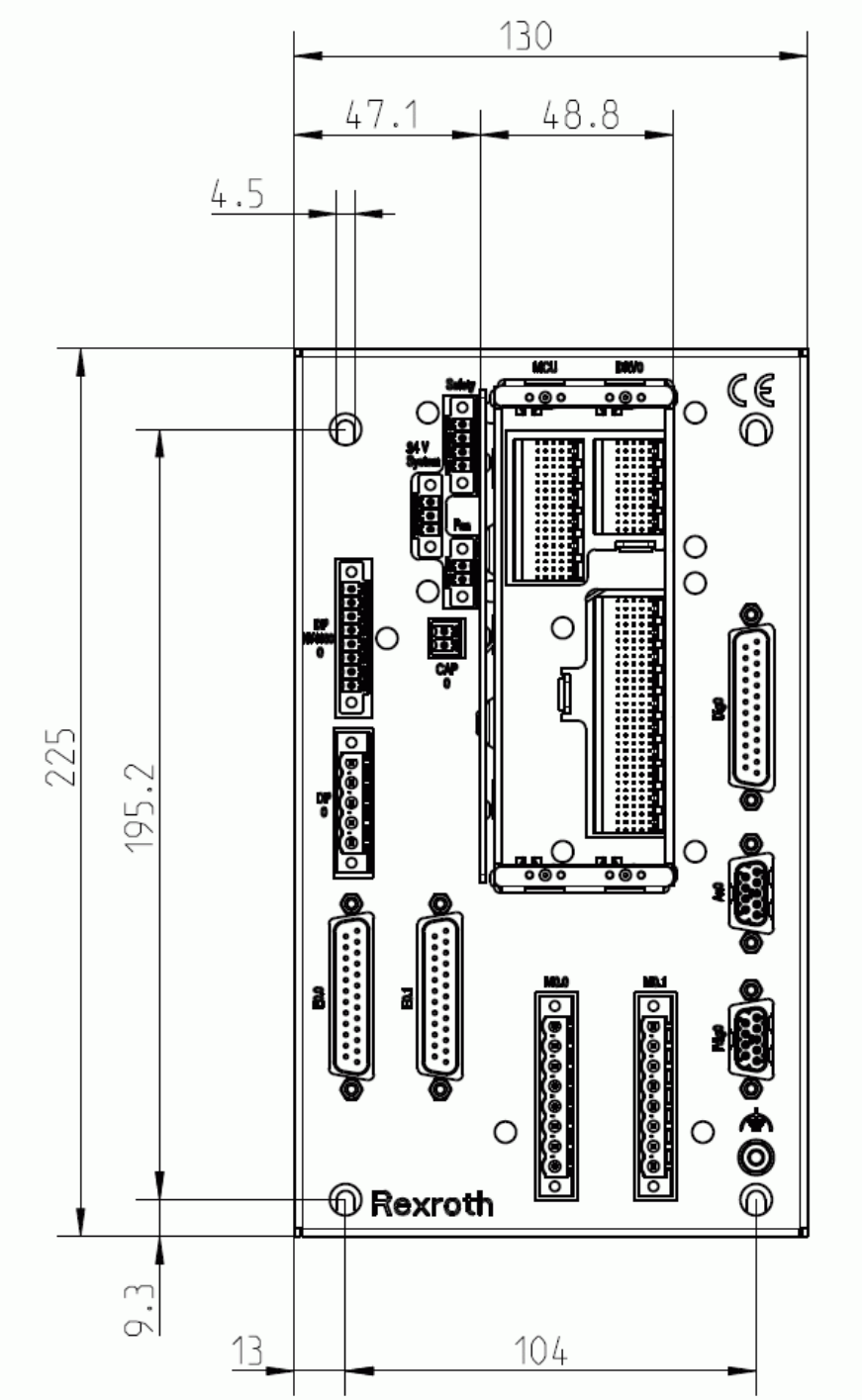


Fig. 119 NY4012 system housing schematic front view

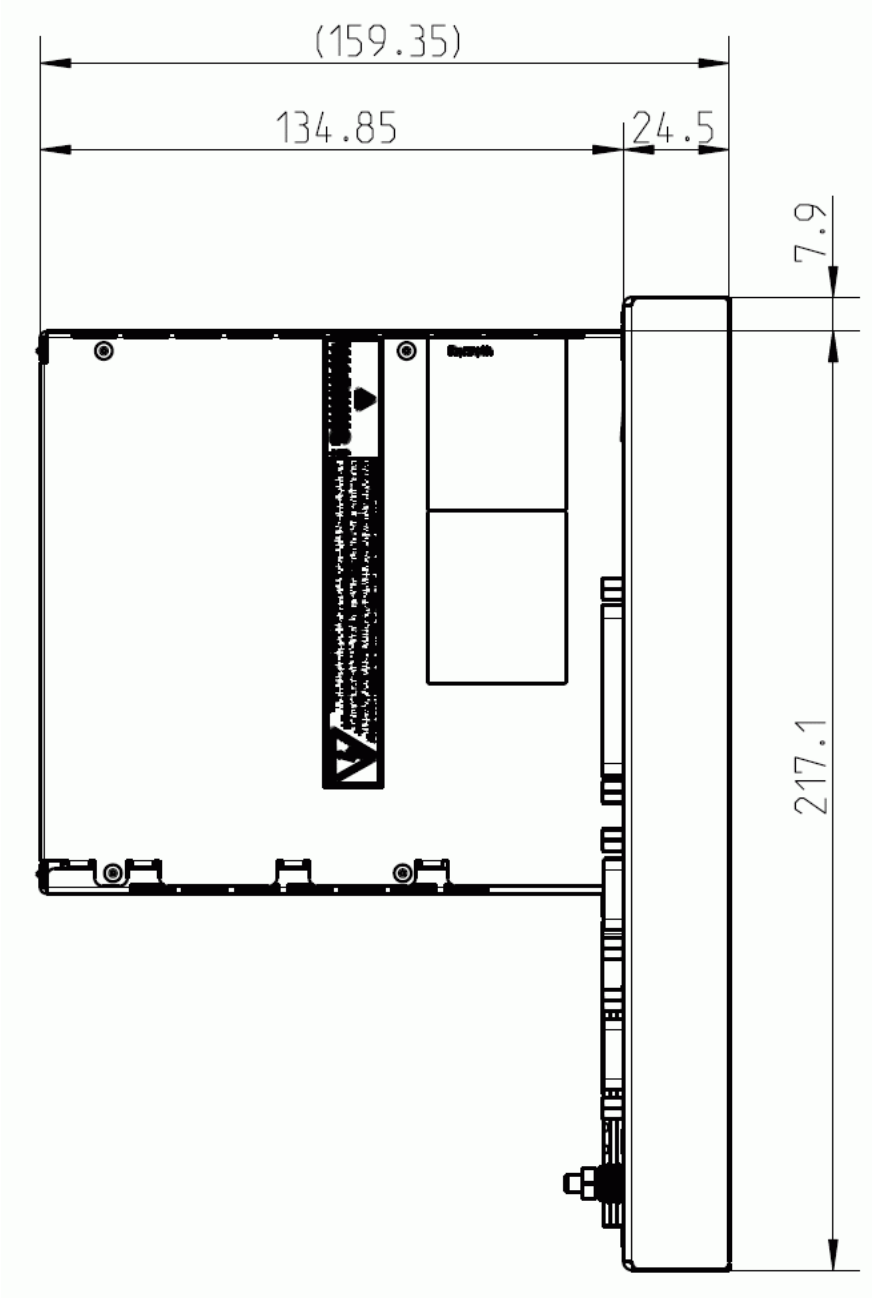


Fig. 120 NY4012 system housing schematic side view

NY4022

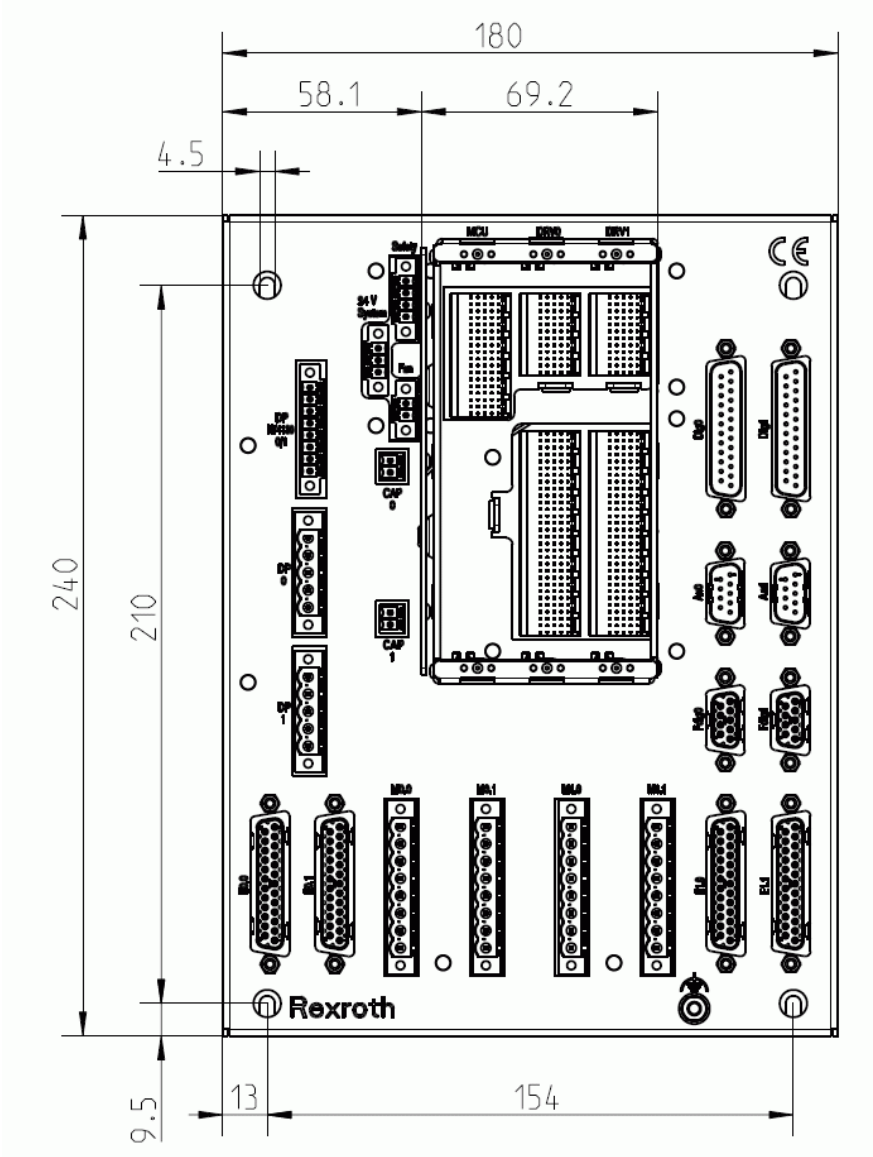


Fig. 121 NY4022 system housing schematic front view

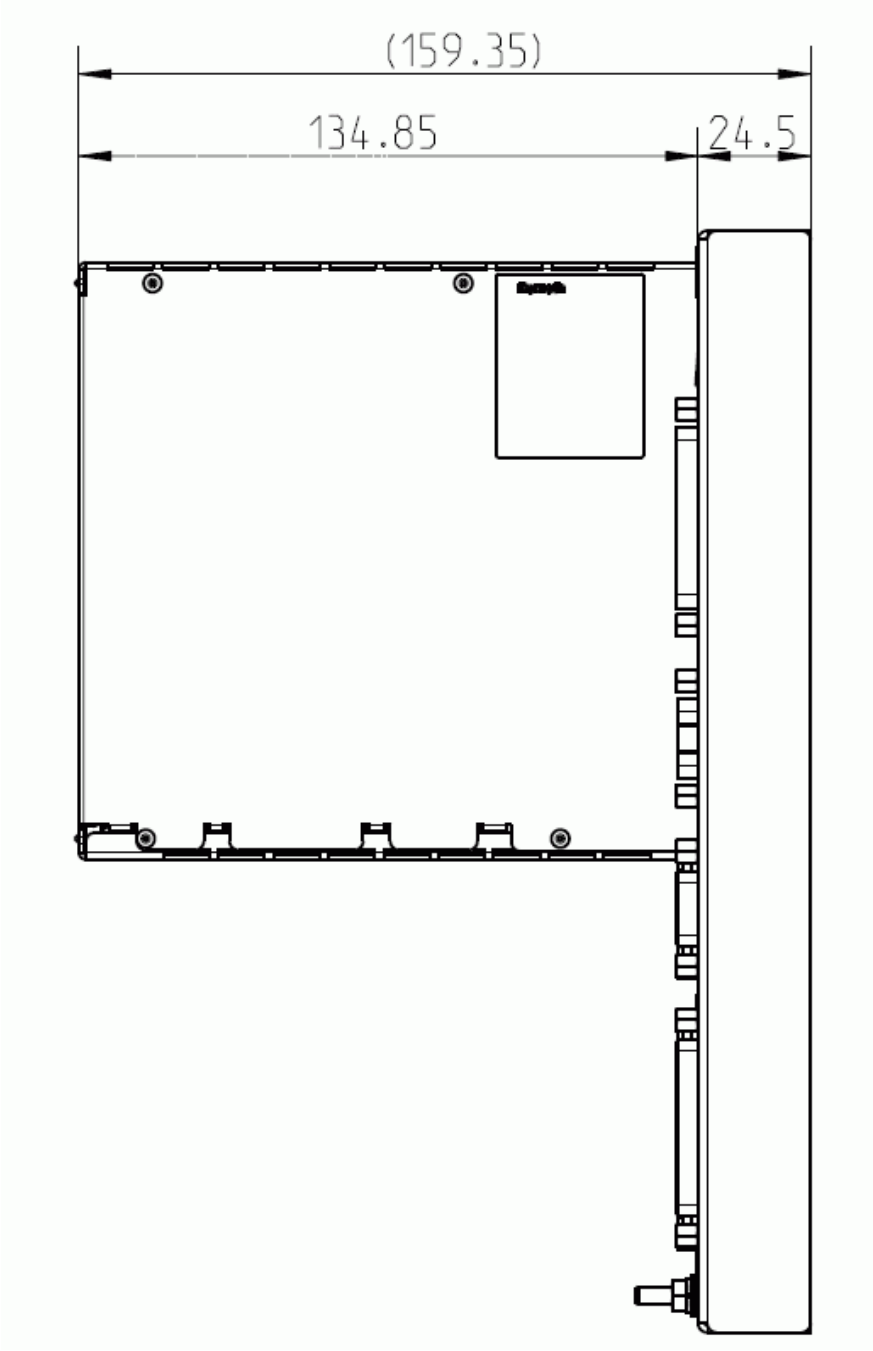


Fig. 122 NY4022 system housing schematic side view

NY4042

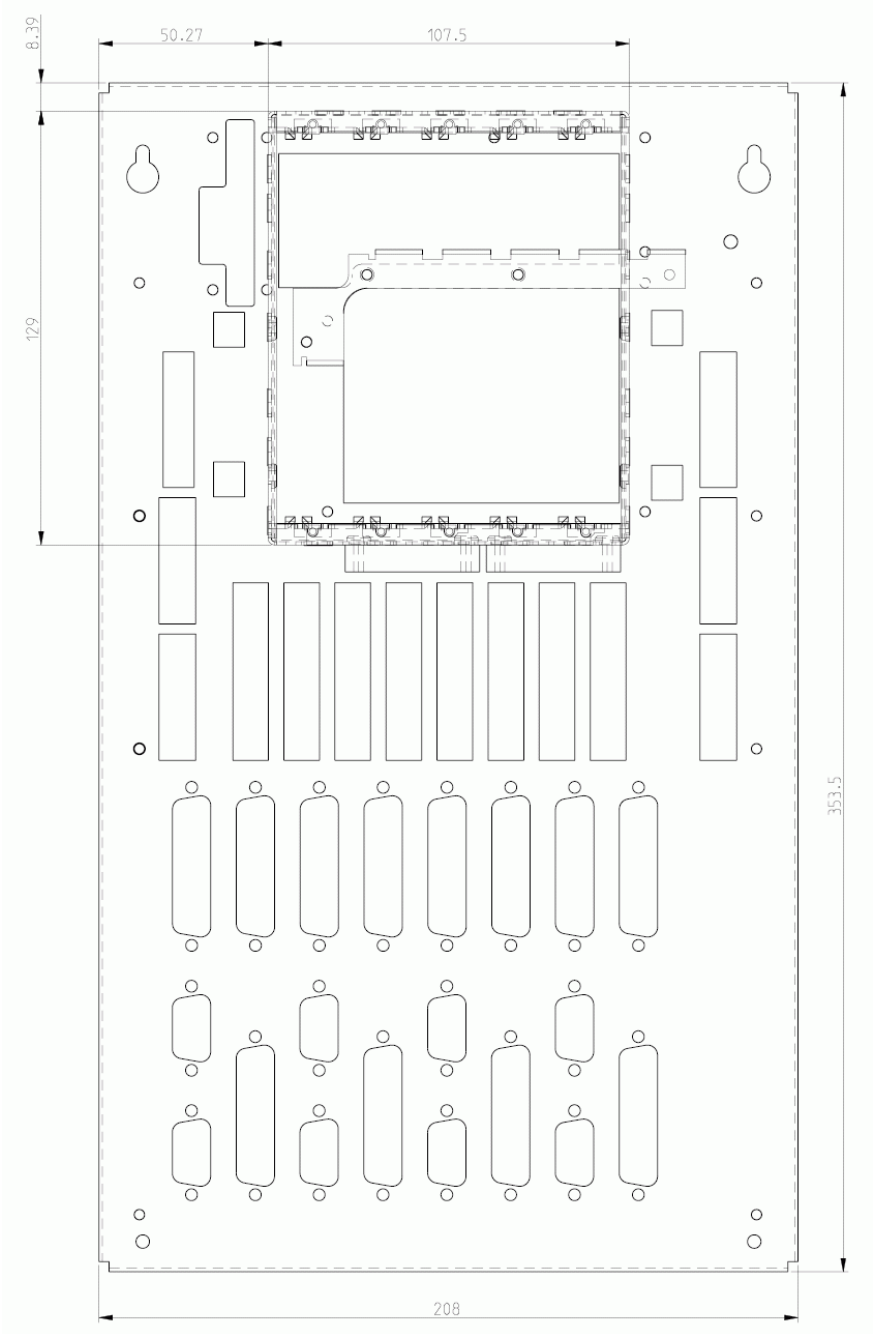


Fig. 123 NY4042 system housing schematic front view

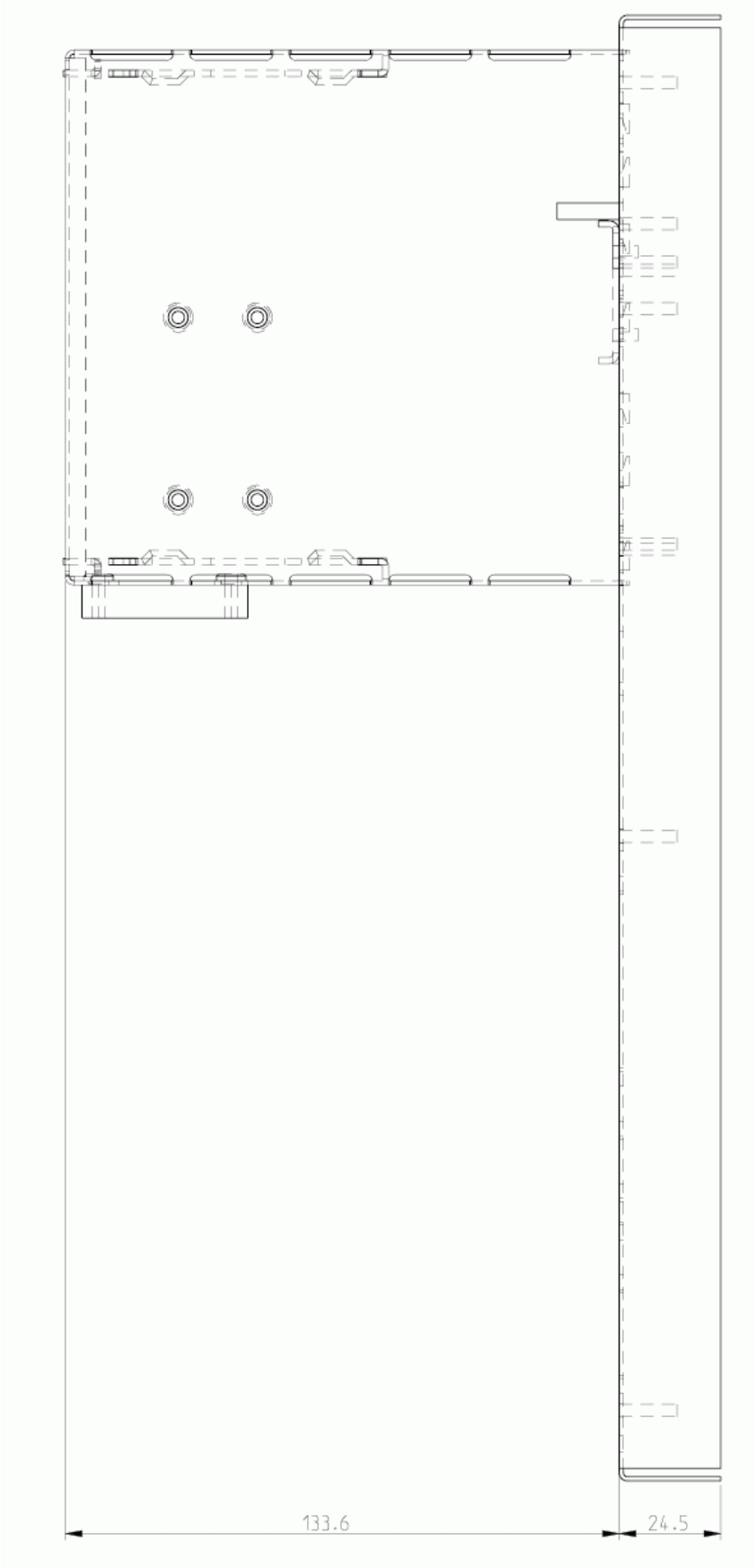


Fig. 124 NY4042 system housing schematic side view

NY4052

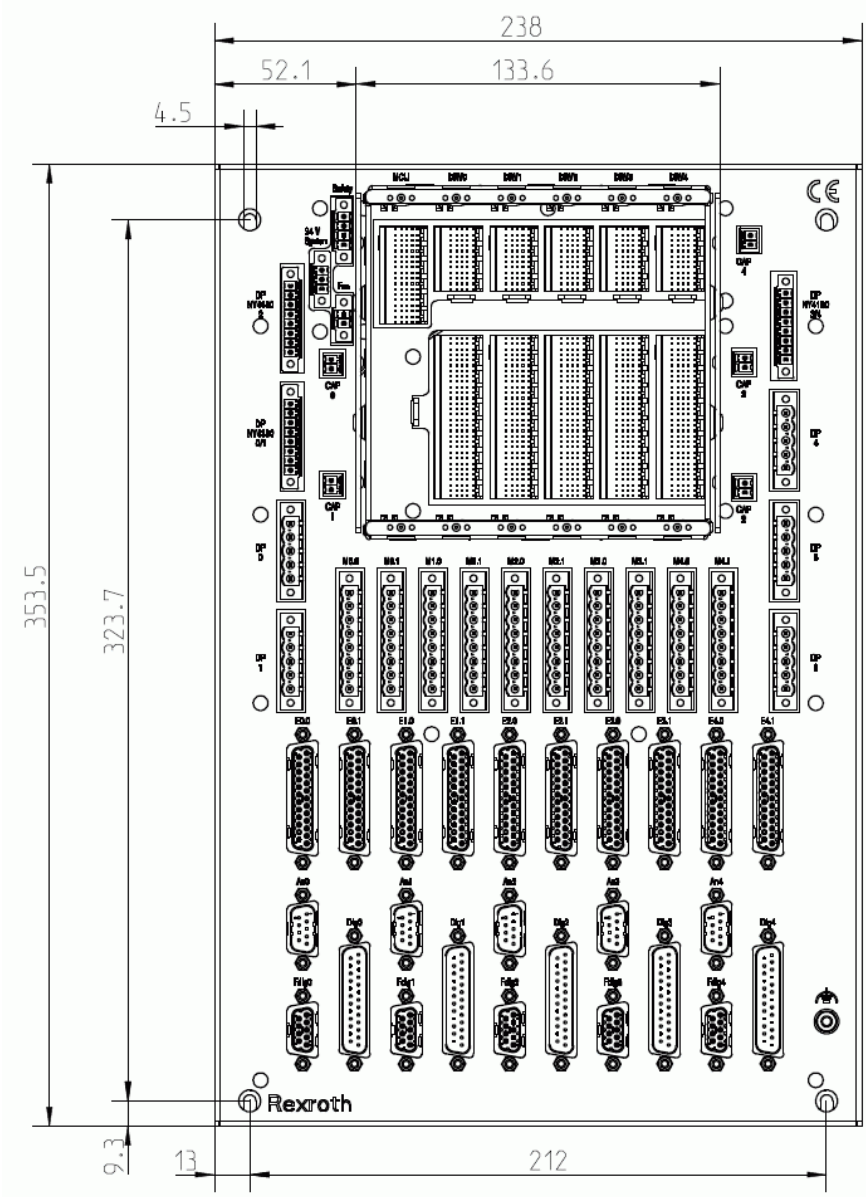


Fig. 125 NY4052 system housing schematic front view

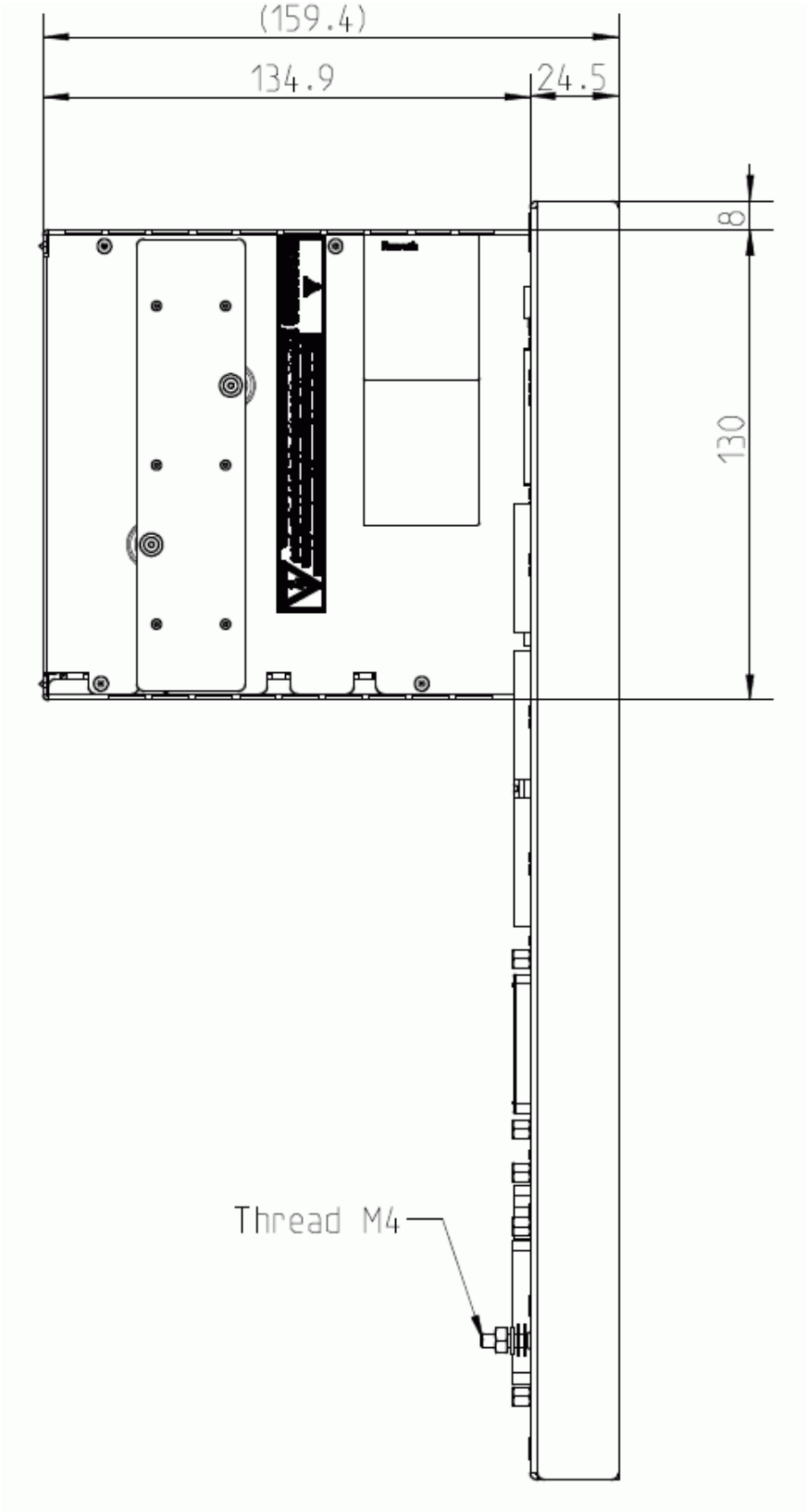


Fig. 126 NY4052 system housing schematic side view

NY4072

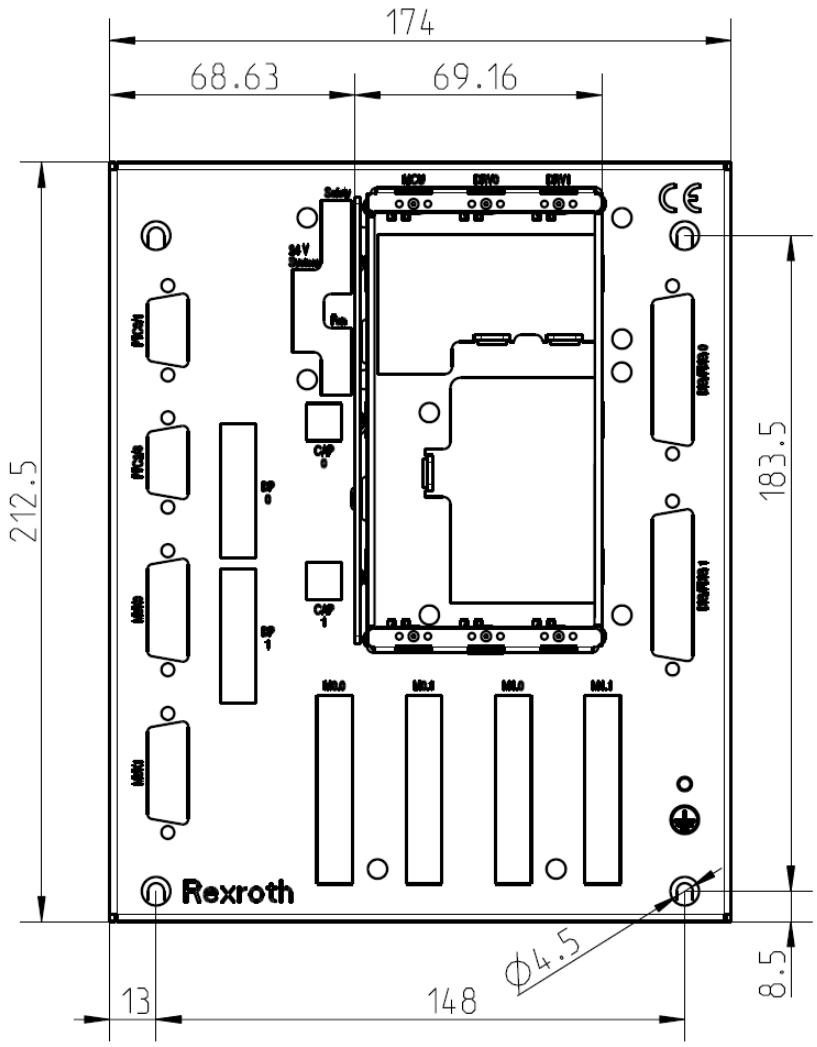


Fig. 127 NY4072 system housing schematic front view

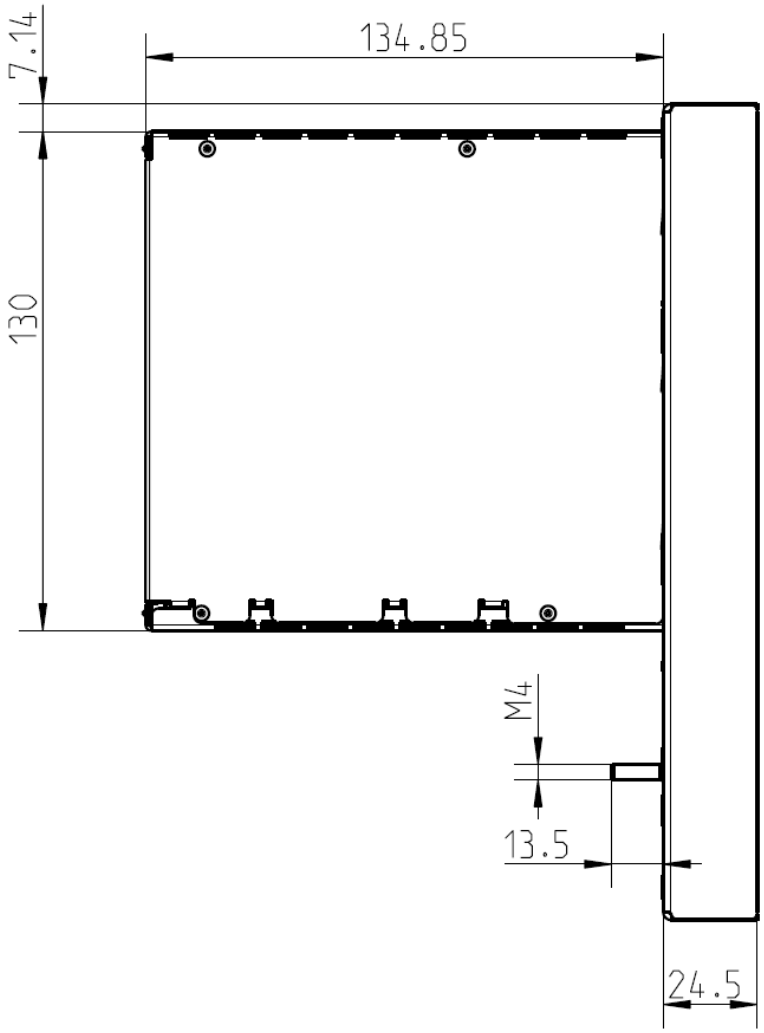


Fig. 128 NY4072 system housing schematic side view

16.3 Legacy system dimensions

- NY4010 - 1 Drive Slot System Housing
- NY4040 - 4 Drive Slot System Housing
- NY4050 - 5 Drive Slot System Housing

NY4010

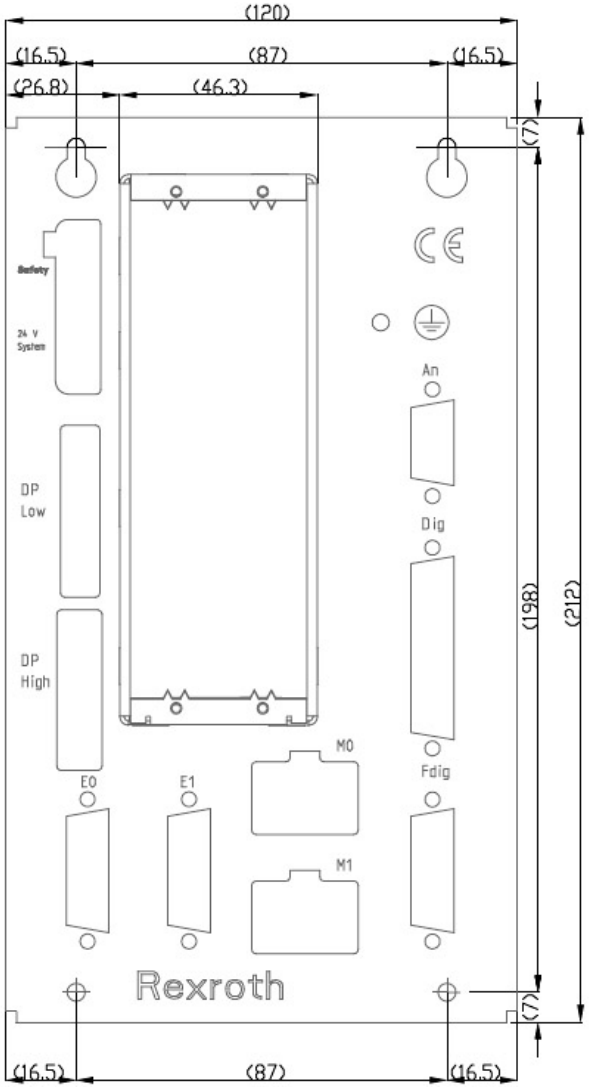


Fig. 129 NY4010 system housing schematic front view

Mechanical Characteristics

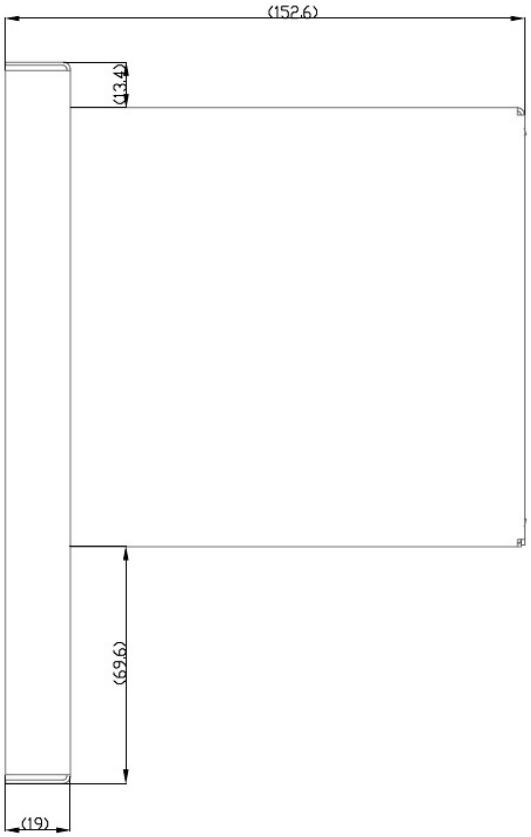


Fig. 130 NY4010 system housing schematic side view

NY4040

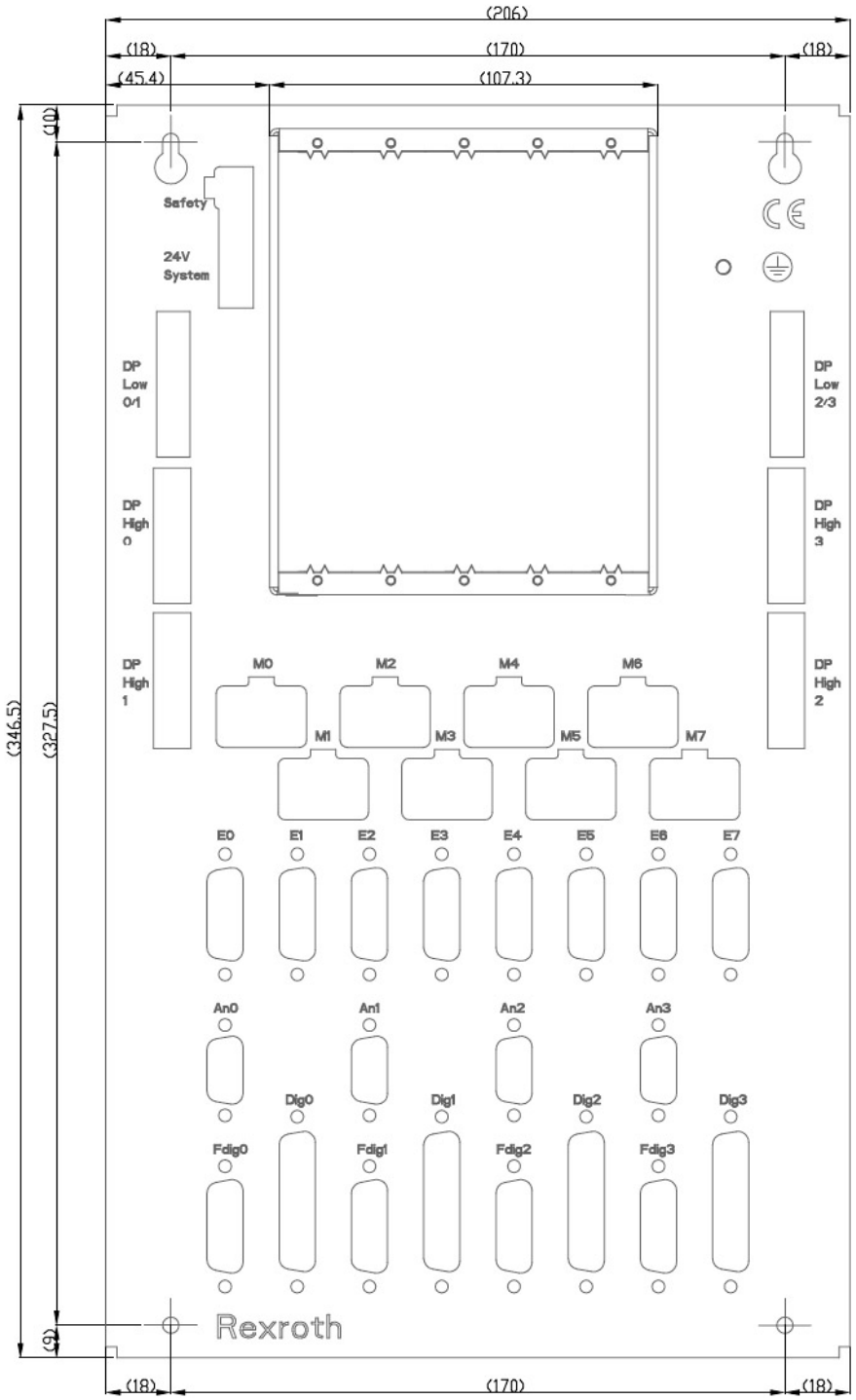


Fig. 131 NY4040 system housing schematic front view

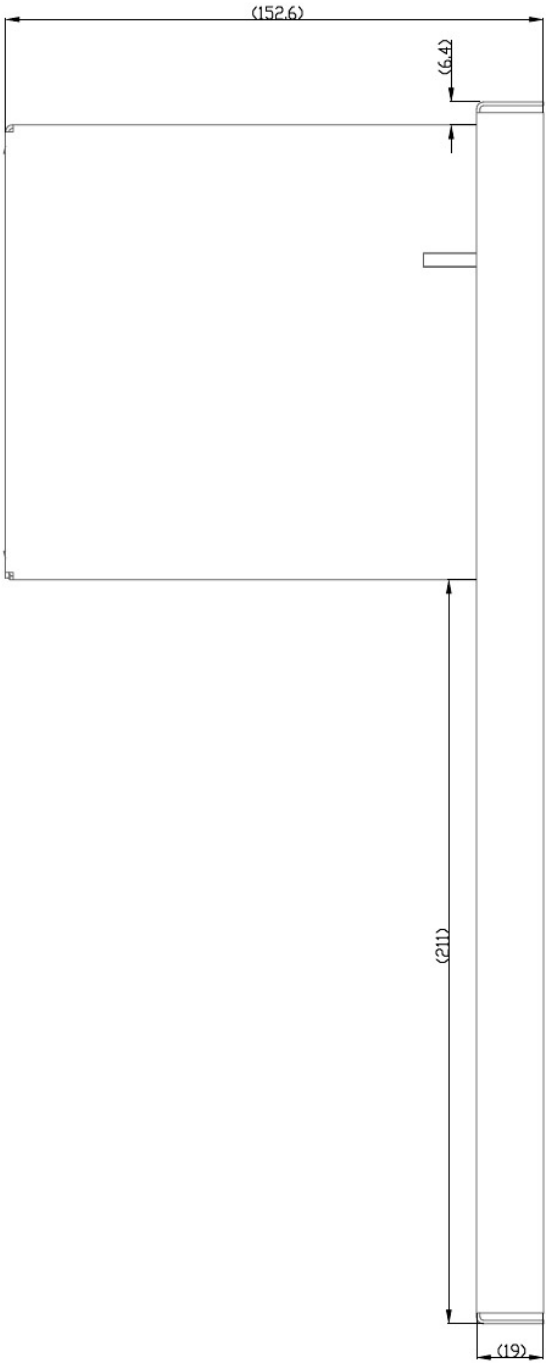


Fig. 132 NY4040 system housing schematic side view

NY4050

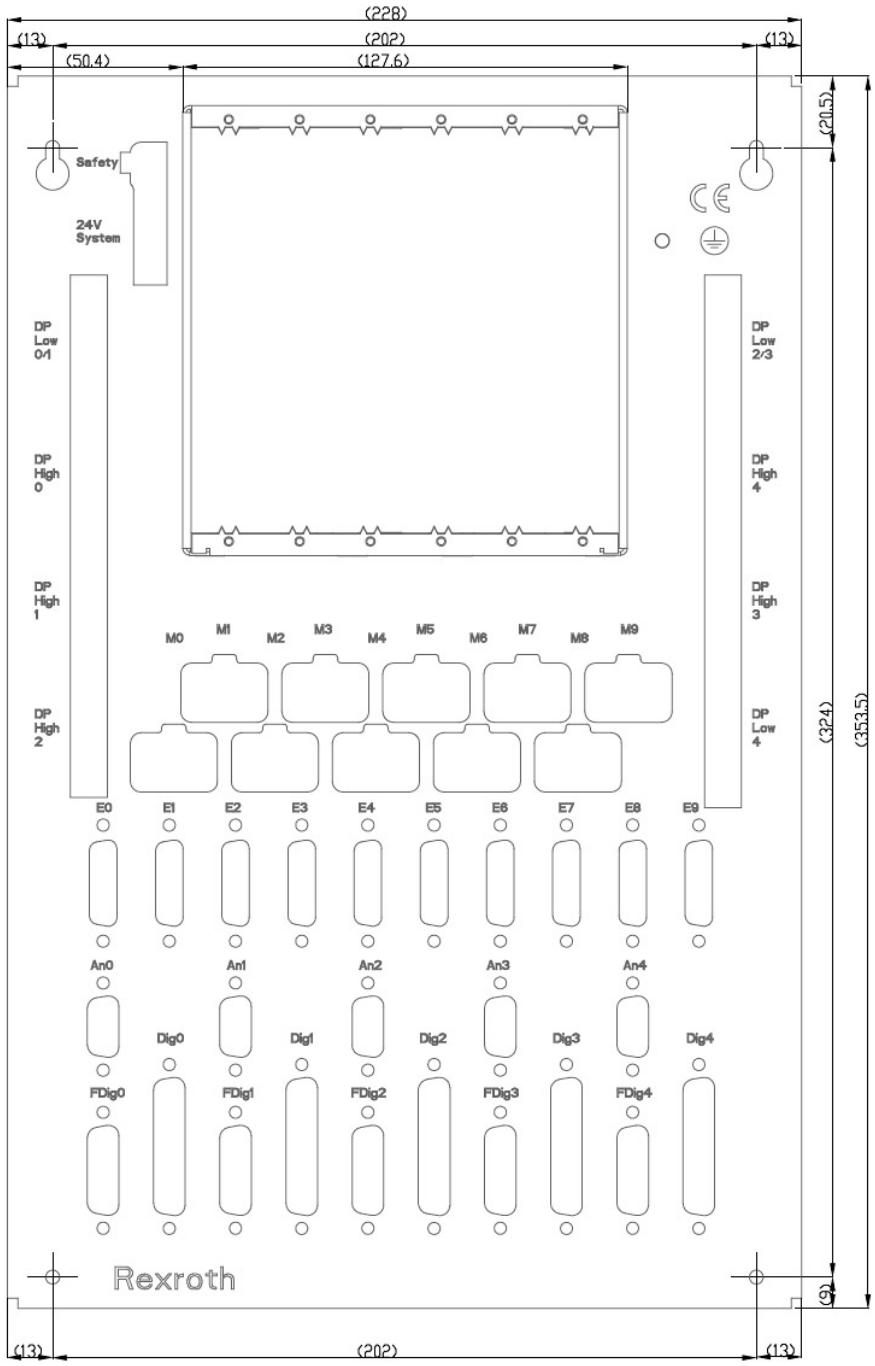


Fig. 133 NY4050 system housing schematic front view

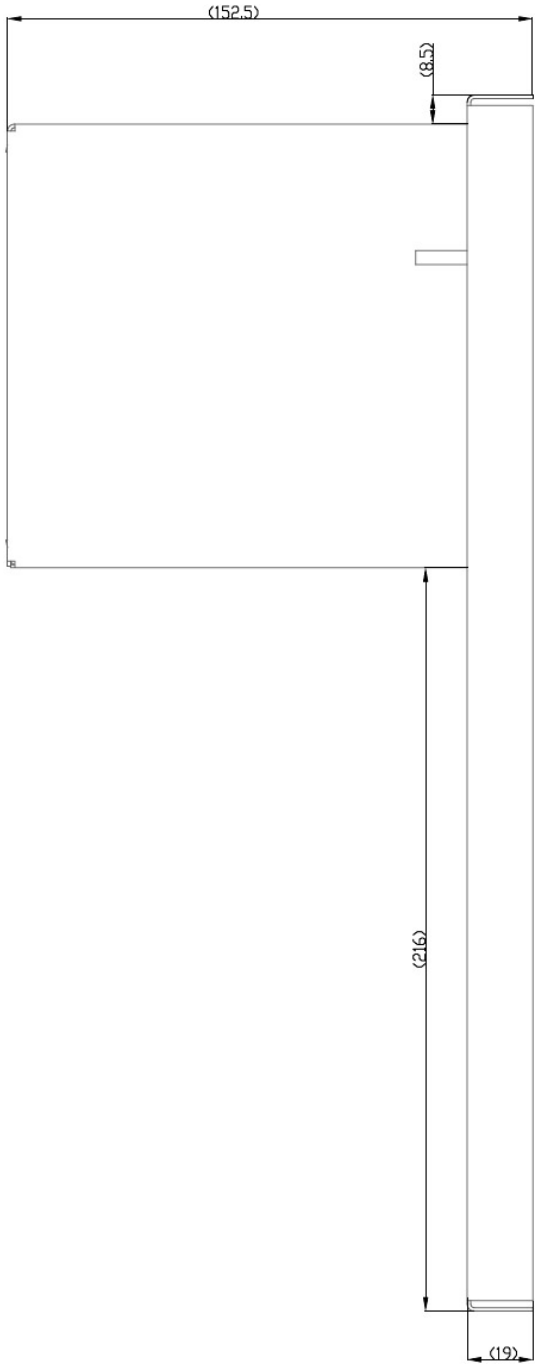


Fig. 134 NY4050 system housing schematic side view

17 NYCe4000 Hardware Glossary

Expression	Definition
Housing module	NYCe4000 motion node housing including the System backplane, which contains and interconnects the functional modules.
System backplane	Interconnect between MCU module and other NYCe4000 motion node modules.
I/O backplane	Connection panel between NYCe4000 motion node modules and motor and I/O connectors.
Motion node	One node on the IEEE 1394 bus capable of controlling up to 10 axis and three user specific boards.
MCU module	Module containing the motion processor. A “Motion Controller” which takes care of the communication to the Industrial PC, and acts as a local motion controller.
Drive module	Module (1 or 2 axis drive) containing the drive technology for stepper motor and/or brushless AC servo motor and/or DC servo motor, analog and digital I/O.
Drive power	Incoming supply voltage for the power stages on the drive modules.
System power	Incoming supply voltage for the logic of NYCe4000 nodes.
I/O power	Digital I/O supply voltage.

18 Earthing, Shielding and Cabling

18.1 Shielding and Earthing

General information on shielding and housing

The galvanic isolation in the NYCe4000 node between the different functions is not intended for a deliberate potential difference between the functions. It is solely intended to control the paths available for interference currents, in order to minimize the effects of electrical noise, eliminate ground loops, etc.

The specific details of the installation and cabling instructions below are based on the general-purpose standard system housing. Custom housings and backplanes should in general be designed in such a way that they offer the same installation and cabling possibilities. Any deviations should be carefully checked for comparable function and performance.

The guidelines below ensure proper functioning and EM compatibility in most applications. In extreme environments or with extra restrictions on the radiated or conducted emission, modifications and/or additional measures may be necessary.

To ensure proper system operation, several galvanic isolated domains are envisioned within the system. These domains are:

- module system domain
- encoder and analog I/O, including IEEE 1394 connection domain
- digital I/O domain
- drive/motor domain
- housing as a mechanical Faraday cage domain

Each area will have its own 0V reference earth. The connections to the outside world can be done by means of shielded cables. All shields must be connected to the mechanics of the housing. This housing / shields play a central role for ESD and noisy disturbances. It is important that the housing is connected with an extreme good connection to the central earth of the machine, where also the motors and power supplies are connected.

The system mechanics will be connected internally capacitive in the high-frequency domain to the MCU ground, to meet the IEEE 1394 requirements.

To prevent floating isolated domains, the mechanics will be connected to the MCU ground via a resistor of 1 MΩ, implemented on the MCU module.

Combination of power supplies

- Two 24V power supply connections are needed for the NYCe4000 node:
  - One for the system power
  - One for all (fast) digital inputs and outputs

  The separation of these power supplies at the NYCe4000 node allows optimization of the cabling, especially in widely distributed and/or complex systems, where it may be desirable to separate the “noisy” functions (for example the power supply for the digital outputs) from the “quiet” functions (for example the power supply for the internal logic).

- In many installations, however, it is quite acceptable for these functions to be combined and connected to a single power supply. In a custom I/O backplane, this may even be done in the backplane itself.
- Never combine the drive power supply in case it is also 24 Volt with the other functions, even if the drive power has enough reserve capacity. (One reason: during regenerative braking of a motor, the supply voltage may swing up to a high value, considerably higher than the value for which the other functions are designed.)
- Ensure that the different “grounds” of the equipment used in the installation are all either more or less equal to safety ground or completely floating.
- (Any floating “grounds” in individual pieces of equipment will in general be fixed to safety earth potential by the detailed installation rules below.)

Mechanical mounting

- Mount the NYCe4000 node on a vertical metal surface, and ensure electrical contact between the housing and this surface, either by means of toothed washers under the screw heads or by making use of the protective earthing post on the housing with toothed washers and nuts.
- When mounting the other equipment on or in a metal frame or mounting base, ensure that there is electrical contact between the housing and the mounting base of each piece of equipment.

Safety earth

- Follow the applicable safety rules for connecting all equipment, including the NYCe4000 nodes, to safety earth.
- Each safety earth connection may be routed in the most convenient manner for the piece of equipment concerned. (For power supplies, for instance, this will generally be the green-yellow wire in the mains cable.) The NYCe4000 system places no extra requirements on the safety earth wiring – no central earth point or similar constraint.

18.2 Cabling

General cabling remarks

- Do not combine signal cables and power cables in the same gutter. Separate them as far as possible. When crossing is necessary, do so at right angles.
- Use shielded cable for all high-frequency signalling. Use shielded cable for the power cable to the motor if the chosen NYCe4000 drive uses the PWM principle.

All power supply cables

- At the power supply side of the cable, connect the minus to the housing and/or to safety earth (if this is not already the case).
- If the cable is shielded, connect the shield on the NYCe4000 side to the shield pin in the connector or to the connector housing, and connect the shield on the other side to the power supply housing.
- Special for the drive power supply: do not forget the filter capacitor and the regenerative Brake Unit at every connection. See the relevant chapters.

Motor cables

In the NYCe4000, the maximum motor output current of the drive modules is limited by the following preventive measures implemented in the drive module hardware and the NYCe4000 software.

- Drive module hardware
  - To prevent damage to the drive modules, the hardware detects motor short currents (> 50 A) and switches the drive off.
    This protection does not work if the short circuit represents a few Ohm.
  - If the maximum low side bridge peak current is higher than 22.2 A, the drive module switches off in hardware.

- NYCe4000 software
  - It is possible to install an event handler to activate a software programmed action in case the I^2t reaches a certain value.
  - It is possible to limit the maximum peak current (20 A) setpoint.
  - It is possible to install an event handler to activate a software programmed action in case the measured peak current is above a certain value.

If the motor wiring is suitable for 15 A or higher, no additional actions for UL certifications are needed, because of the above mentioned possibilities.
If the motor wiring is not suitable for 15 A rms, two UL allowed preventive measures are possible to limit the current under all single fault conditions.

1. Adding fuses in each motor wire. An UL certified fuse must be selected in combination of the AWG marking of the cable, taking into account the number of separate wires in the cable and the number of cables in the cable duct.
2. Adding an UL certified fuse between the drive power input voltage and the power supply output voltage. The rating of this fuse depends on the used cables and application requirements of the motion profiles. Formulas for calculating this fuse can not be given. It must be defined on an experimental basis in the application, and tests must be performed to convince the UL notified body that the fuse is sufficient for all single fault conditions.

For the NY4120 and NY4140 drive modules using the PWM principle, always use a shielded cable. For the NY4130 drive, a shielded cable is recommended but not mandatory. Connect the shield on the NYCe4000 side to the shield pin in the connector, and connect the shield on the other side to the motor housing.

Encoder and/or Hall sensor cable; Analog input; Analog output

- Always use a shielded cable.
- Connect the shield on the NYCe4000 side to the connector housing.
- If the equipment housing on the “other side” is metal, connect the shield to the equipment housing.
- If the equipment housing on the “other side” is non-metal, connect the shield to the equipment ground via a 100Ω series resistor.
- Special for encoder interface: If the encoder interface has open-collector drivers, include a pull-up resistor of for example 1 KΩ between each signal and the 5V_ENC connection.
- Special for encoder or Hall sensor interface: If the encoder or Hall sensor interface has single-ended drivers, wire the negative input of each signal pair in the NYCe4000 connector to the reference voltage EncVref.
- *Special for analog input*
  - If the analog source provides a single-ended signal, connect the signal wire to the positive input pin on the NYCe4000 side, and connect the equipment ground to the negative input pin on the NYCe4000 side.
  - If the analog source provides a balanced differential signal, connect the signal wires to the corresponding input pins on the NYCe4000 side. (It may

also be desirable to connect a termination resistor between the signal wires at the NYCe4000 side. Consult the supplier's installation instructions.)

- *Special for analog output*
  - If the analog input at the destination equipment accepts a differential signal (preferred!), connect the positive input to the analog output on the NYCe4000 side, and connect the negative input to the AGND reference on the NYCe4000 side.
    Also make sure that at the destination equipment some resistive path is present for equalization current, for example 100 KΩ between the negative input and the local ground. If this resistance or some equivalent is not included in the equipment itself, install it in the connector at the equipment side of the cable.
  - If the analog input at the destination equipment only accepts a single-ended signal (not recommended!), connect the input to the analog output on the NYCe4000 side, and connect the ground of the destination equipment to the AGND reference on the NYCe4000 side via a 100Ω resistor.
    Note: This connects the internal ground of the NYCe4000 nodes to the internal ground of the destination equipment. A series resistor in this ground connection is recommended to prevent unwanted stray currents. However, this resistance may well influence the accuracy of the analog signal.

- **Never** connect the ground/minus wires of these signals to other grounds otherwise malfunction of the module is possible.

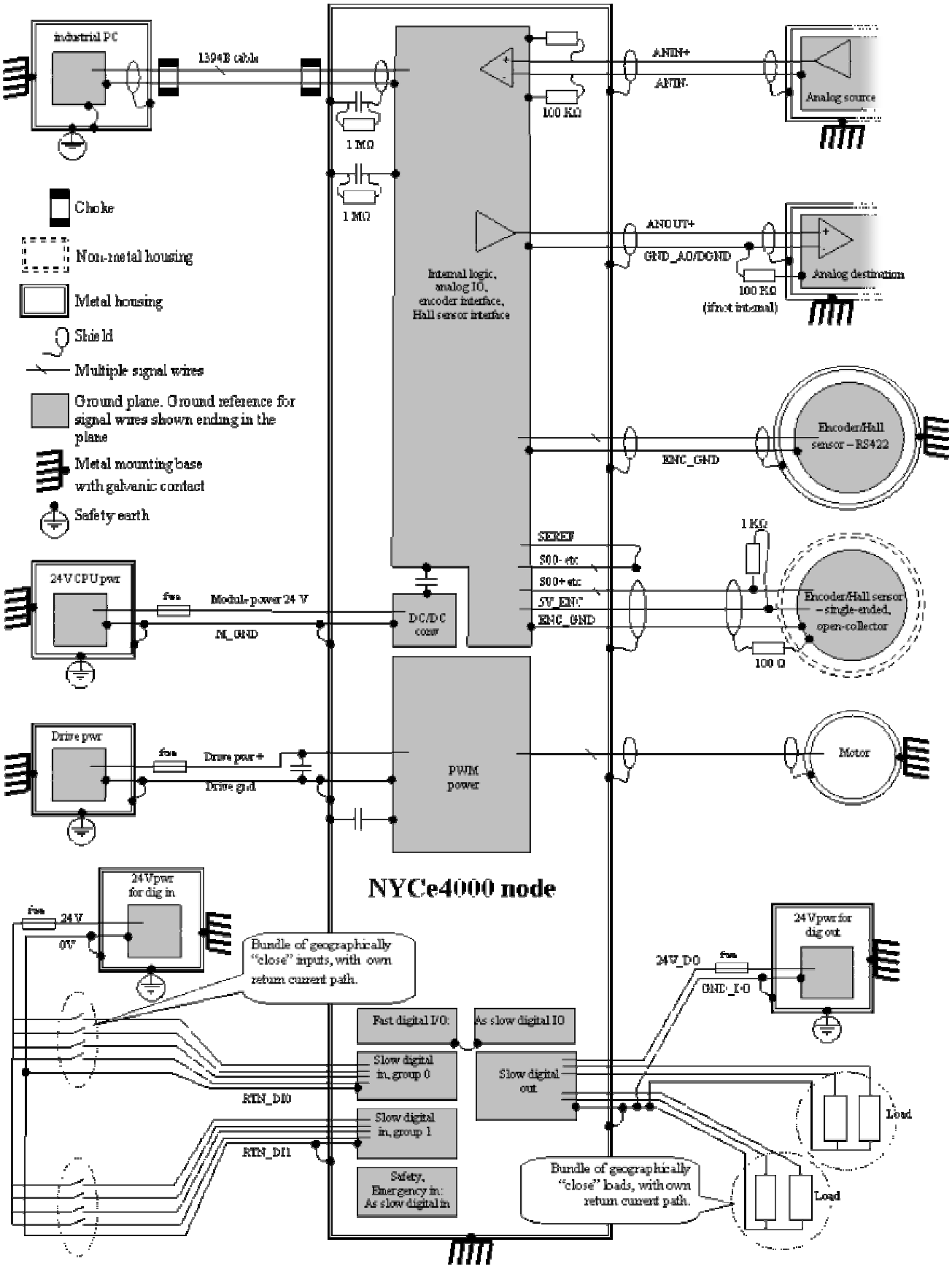
Digital I/O; 24V power supply for the digital I/O

- Shielded cable is recommended but not mandatory. If used, connect it on the NYCe4000 side to the connector housing. Connect it on the "other" side to a convenient metal part or leave it open.
- For the fast digital I/O, the cable with the signal wire(s) should also contain the return current path for every signal in the cable. (It is all right for a single wire to carry the return currents of more than one signal, as long as the current rating of the wire is not exceeded.) For the digital I/O, this is also recommended. See some details further on.

PC

The industrial PC is connected to the NYCe4000 node via a FireWire cable. Make sure that the FireWire PCI controller card in the PC is fixed with a screw to the metal housing of the PC.
The metal housing of the PC must have a good ground contact to the housing of the NYCe4000 node.
The mains outlet used for the power supplies of NYCe4000 system is also used for the PC, to prevent the possibility of different earth connections.

Earthing, Shielding and Cabling



19 Environmental Conditions

19.1 Thermal

Operating

- Temperature : +5 °C … +55 °C
- Relative Humidity : 10% … 90%

Storage

- Temperature : -40 °C … +85 °C
- Relative humidity : 5% … 95% (non condensing)

Thermal compatibility

- Cold: IEC 60068-2-1
- Dry heat: IEC 60068-2-2
- Dry heat steady state: IEC 60068-2-3
- Rapid change: IEC 60068-2-14
- Damp heat: IEC 60068-2-30

Free air

Ensure that an air column of 10 cm^3 (for forced cooled systems) or 20 cm^3 (for convection cooled systems) per cm^2 of housing surface on the top and bottom (typically 10 or 20 cm respectively of free space above and below the housing) can flow freely in a vertical direction through the ventilation holes. In particular, bend the cabling away from the ventilation holes as near to the connectors as possible. (The internal components requiring the most cooling are mostly mounted near the front of the housing.)

19.2 Shock and Vibration

Mechanical: Non-operating

- Vibration : IEC 60068-2-6
- Bump : IEC 60068-2-29

Mechanical: Operating

- Vibration : IEC 60068-2-6

19.3 Electromagnetic Compatibility

Emission

Standard EN 55022 is met (class A).

Immunity

Standard EN 55024 is met:

- Electrostatic discharge : IEC 61000-4-2
- Radiated, RF electromagnetic field : IEC 61000-4-3
- Electrical fast transient (burst) : IEC 61000-4-4
- RF conducted disturbances : IEC 61000-4-6

20 Cleaning, Disposal and Environmental Protection

20.1 Cleaning

Softly wipe the surface with a dampened cloth using a diluted neutral detergent or alcohol, and then wipe the surface again with a dry cloth. For systems without a fan, use a compressor or vacuum cleaner to blow off the accumulated dust in the ventilating channel of the housing and inside the housing.

Note:
Do not use a compressor or vacuum cleaner on systems with a fan. Remove the fan before cleaning the system.

20.2 Disposal

Products

Our products can be returned to us free of charge for disposal. It is a precondition, however, that the products are free of oil, grease or other dirt. In addition, when returned the products mustn't contain any undue foreign matter or foreign component.

Please send the products free domicile to the following address:

Bosch Rexroth AG
Electric Drives and Controls
Bürgermeister-Dr.-Nebel-Straße 2
D-97816 Lohr am Main

Packaging Materials

The packaging materials consist of cardboard, wood and polystyrene. They can be easily recycled. For ecological reasons you should not return the empty packages to us.

20.3 Environmental Protection

No Release of Hazardous Substances

Our products do not contain any hazardous substances that they can release in the case of appropriate use. Normally there aren't any negative effects on the environment to be expected.

Materials Contained in the Products

Electronic Devices

Electronic devices mainly contain:

- steel
- aluminum
- copper
- synthetic materials
- electronic components and modules

Motors

Motors mainly contain:

- steel
- aluminum
- copper
- brass
- magnetic materials
- electronic components and modules

Recycling

Due to their high content of metal most of the product components can be recycled. In order to recycle the metal in the best possible way it is necessary to disassemble the products into individual modules.

The metals contained in the electric and electronic modules can also be recycled by means of specific separation processes.

The synthetic materials remaining after these processes can be thermally recycled.

21 Service and Support

21.1 Helpdesk

Unser Kundendienst-Helpdesk im Hauptwerk Lohr am Main steht Ihnen mit Rat und Tat zur Seite.

Sie erreichen uns

Our service helpdesk at our headquarters in Lohr am Main, Germany can assist you in all kinds of inquiries.

Contact us

telefonisch - by phone: **+49 (0) 9352 40 50 60**

über Service Call Entry Center (Mo-Fr 07:00-18:00)

via Service Call Entry Center (Mo-Fr 7:00 am - 6:00 pm)

per Fax - by fax: **+49 (0) 9352 40 49 41**

per e-Mail - by e-mail: **service.svc@boschrexroth.de**

21.2 Service-Hotline

Außerhalb der Helpdesk-Zeiten ist der Service direkt ansprechbar unter

After helpdesk hours, contact our service department directly at

+49 (0) 171 333 88 26

oder - or: **+49 (0) 172 660 04 06**

21.3 Internet

Unter **www.boschrexroth.com** finden Sie ergänzende Hinweise zu Service, Reparatur und Training sowie die aktuellen Adressen unserer Vertriebs- und Servicebüros.

At **www.boschrexroth.com** you may find additional notes about service, repairs and training in the Internet, as well as the actual addresses of our sales- and service facilities

21.4 Vor der Kontaktaufnahme... - Before contacting us...

Wir können Ihnen schnell und effizient helfen wenn Sie folgende Informationen bereithalten:

1. detaillierte Beschreibung der Störung und der Umstände.
2. Angaben auf dem Typenschild der betreffenden Produkte, insbesondere Typenschlüssel und Seriennummern.
3. Tel.-/Faxnummern und e-Mail-Adresse, unter denen Sie für Rückfragen zu erreichen sind.

For quick and efficient help, please have the following information ready:

1. Detailed description of the failure and circumstances.
2. Information on the type plate of the affected products, especially type codes and serial numbers.
3. Your phone/fax numbers and e-mail address, so we can contact you in case of questions.

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